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## RETURN OF VISION AND OTHER OBSERVATIONS IN GRAFTED VERTEBRATE EYES\*

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A great variety of studies has been recorded upon the general subject of reimplantation and transplantation of the functional vertebrate eye. However, there remain considerable gaps in our present knowledge concerning the effects of this type of operation. Results both positive and negative have been added to a confusion already existing. In no single species of vertebrate has a complete history been made in which both the microscopic and macroscopic appearances of the grafts have been recorded from observations taken at close intervals and extended over a long period of time. It is quite true that in no instance has the number of animals surviving operation been sufficient to make such studies complete. It seems clear that a thorough re-study should be made of the entire subject.

There is a great power of regeneration among the amphibians, which contributes much to the degree of success with which the eye can be grafted in this class of animals (Stone and Ussher, '27; Beers, '29; Stone, '30; Stone and Cole, '31; Stone et al, '34). It is therefore appropriate to bring together what information we can

in this group of vertebrates through an exhaustive study of the reimplanted and transplanted functional eye of both young and adult animals. A similar study should be made in each of the other types of vertebrates. This we are attempting to do in a manner similar to that which we have done in amphibians. The major problems involved, such as retinal, corneal, lenticular, circulatory, and pigmentary changes and pupillary, corneal, and visual reflexes along with the growth of the bulb and optic nerve of the graft, have already been discussed in an introductory chapter of a previous paper (Stone, '30) to which the reader may be referred for a brief review of the literature.

### MATERIALS AND METHODS

For studies in age differences the larvae and young and old adults of the black, yellow-spotted salamander, *Amblystoma punctatum*, were used. The adults of the common red-spotted newt, *Triturus viridescens*, were also used extensively. In some cases the eyes of the latter were exchanged for those of the adult *Amblystoma punctatum* and vice versa. In another study the larval eyes of *A. punctatum* and *A. tigrinum* (the tiger salamander) were exchanged (Stone, '30). Altogether over 700 larval and adult amphibian eyes were either reimplanted or transplanted in their normal position in the orbit, and daily observations of the eyes while living were cor-

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related with closely staged histological studies. In a few instances the grafted eye was rotated either 90 degrees or 180 degrees anteroposteriorly in order to make further comparative studies.

For a detailed account of technique in operation the reader is referred to a previous paper by the author (Stone, '30). It may be briefly stated, however, that the animals were anesthetized in a weak solution of chloretone and water. They were then placed under the compound dissecting microscope, where the eye was carefully excised and grafted with the aid of finely sharpened iridectomy scissors and forceps. When the technique is properly mastered it is rare to find hemorrhage occurring. First, an incision is made around the eye, following the outer edge of the cornea. Then the muscles and optic nerve are exposed to view and cut. After the eye is removed and the orbit examined, it is gently pressed into its own (reimplant) or into a new (transplant) orbit which contains a sticky serous fluid that holds it in place. Neither asepsis nor sutures are necessary.

After the operation, which usually requires from 5 to 10 minutes, the animal is transferred to its own aquarium, where it is kept for daily observations. In the case of larvae, which possess external gills, the animals are placed directly into water, where they recover in less than an hour. Adults are kept immobile from 24 to 36 hours by placing them upon filter paper moistened with chloretone solution. During the brief immobile stage the eye heals in place.

Specimens were killed at frequent intervals from the first day to many months after operation for microscopic studies. Some specimens were kept alive for more than a year.

#### EXPERIMENTAL RESULTS

The first evidence of return of circulation was observed in the motion of blood

corpuscles within the superficial network of vessels in the iris and in the peripheral portions of the bulb. The earliest evidence was obtained in 18 hours in larvae, in 24 hours in young adults, and on the third day in old adults. In each of these groups, however, the majority showed circulation two or three days later than the periods just indicated. There was a tendency for the circulation to return only slightly later in transplants than in reimplants.

Occasionally, temporary opacity in the cornea or transitory pigmentation films on the cornea lasting for several days caused delay in recording return of circulation. Vessels of the iris were often engorged with blood cells after operation, especially just preceding the beginning of circulation. In a few cases there were slight subcorneal hemorrhages which disappeared within a few days, leaving no marked effect.

In a few animals at the beginning of the experiments, when the technique of operation was being perfected, eyes were sometimes injured in varying degrees. In severe injury, collapse and sloughing of the eye took place before circulation was reestablished. In no case was there complete loss of the eye if circulation was once reestablished after the operation.

In larvae, even if the eye was injured to the extent that eventually only a medial portion of the bulb healed in place, the remnant of the graft produced a miniature eye by the time of metamorphosis. None of these eyes ever showed visual function even though in one case (transplant) a slender tortuous optic nerve connected the brain and the bulb. If an injury was extensive enough in adult grafted eyes to initiate sloughing, the eye never recovered. Its disintegration was complete.

Following operation there is a slight reduction in the size of the grafted eye in both larvae and adults. This is illustrated

in figure 1, where the growth curves of the normal and reimplanted eyes are compared in a larva from the time of operation up to the adult or metamorphosed stage (M). Sometimes in larval eyes the reduction is so slight that it is difficult to measure. In the typical case shown in figure 1, the temporary reduction in size reached its maximum by the fifth day after operation. Immediately follow-

normal size during that period of time. Moreover, when the lens is removed, there is a slight decrease in the size of the eye. This, however, is only temporary, for careful measurements show that by the 120th day recovery is complete. In adult grafts the retinal changes are very extensive following operation. With the exception of the ciliary margin, the entire retina rapidly undergoes degeneration

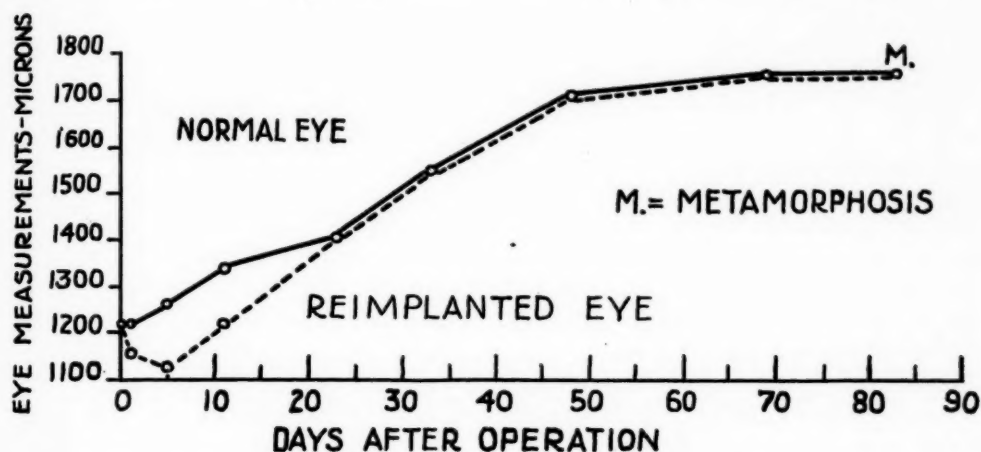


Fig. 1 (Stone). Showing growth curves of normal and reimplanted eyes in a case from the time of operation to 83 days later. Note sudden but temporary decrease in the size of the reimplanted eye (dotted line) immediately after operation due to loss of fluids and blood cells. Long before metamorphosis (M) it became equal to that of the normal eye.

ing this, the eye rapidly recovered, until at the end of the third week it was equal in size to that of the normal left eye. Its subsequent growth showed no departure from the control. In the larvae, the slight but temporary reduction in the size of the eye is due to a loss of varying amounts of tissue fluids and blood elements associated with the operation. As soon as circulation returns, the eye immediately begins its phase of recovery.

In the case of the grafted adult eye, the postoperative decrease in size usually is never very great. However, careful measurements of the eye in the fresh unpreserved condition show that up to 365 days after operation there is good but not complete recovery. Cases vary from 85 percent to 92 percent of attaining their

until by the 20th to 25th day the destruction is completed. It is at this time that the grafted eyes reach the maximum decrease in size. Control experiments showed quite clearly that merely cutting the blood supply to the eye is the cause which initiates the disintegration of the retina. From the ciliary margin a new retina regenerates completely in less than six weeks in young adults. In old adults recovery is retarded from one to three weeks longer.

In larval grafts the situation is quite different. During the first few days after operation when the grafted eye is reduced in size, cells of all retinal layers are temporarily crowded, due to loss of fluid and blood. By the time the eye has recovered after the return of circulation, many cell

counts show that varying numbers of ganglion cells are lost (8 percent to 60 percent). As a rule, other layers in the retina do not seem to be affected. Long after operation one can see in the ganglion zone spots denuded of cells. These remain as permanent records of the early loss of cells during the first two weeks after operation.

The lens does not degenerate in the grafted larval eye, but in the adult it does so quite rapidly. By the 18th to the 20th day after operation a new lens begins to regenerate from the dorsal part of the pupillary margin of the iris. At the end of 365 days, the size of the regenerated lens varies from 72 percent to 92 percent of the control. If the lens is removed by an incision through the cornea a new lens regenerates in the same manner, even more rapidly, but it still does not attain the size of the original lens. This statement is based on many measurements of the lens in the fresh unpreserved state.

In many specimens kept sufficiently long for nerve regeneration, the optic nerve failed to reach the chiasma in only a few cases (less than 1 percent). Barriers of connective tissue and muscle along the pathway of the nerve were the chief causes of obstruction. This largely involves eyes which were grafted in a rotated position.

In about half of the adult grafts a slight or even considerable opacity of the cornea took place. Except in a few eyes which sloughed, this condition was transient, usually disappearing within a few days. During the period of opacity, histological examination showed edema and thickening of the cornea. Similar examinations, long after the condition of opacity had disappeared, showed that such corneas became permanently thicker than normal.

In larval grafts it was extremely rare

to find cloudiness of the cornea. Except for eyes sloughed or partially resorbed, the opacity disappeared in a few days leaving no traces. In about 50 percent of the larval grafts, a temporary invasion of skin pigment took place from host tissue upon the cornea. However, in all cases in which this occurred the pigment cells rapidly disappeared during the first week.

In the larvae, as in most larvae of amphibians, there is no retraction of the eye before metamorphosis. The corneal reflex cannot be obtained until the adult stage—a time when the eyelids develop and the eyes bulge considerably from the surface of the head. In every case in which the larval eye had been grafted, and the host had been kept until the adult stage, the corneal reflex was present. When the adult eye was grafted, the corneal reflex was found to return between three and six weeks after operation.

In larval and adult grafts the ocular movement reappeared quite normally in some cases. In many, the degree of movement was limited, owing to irregular muscle attachments. Movement in the larval eye returned rapidly, for it was noted as early as the end of the first week after operation. In the majority of cases, however, this had been established by the end of the second week. In adults, free movements were not noticed until about the sixth week, when the restitution of the eye in general was well established.

In one type of adults used (*Triturus*) there is no measurable pupillary response to light and darkness. This is also true in the *Amblystoma* larvae. In the latter species it is only after the metamorphosis of the host that the pupillary reflex is established (Stone, '30). This is true even though the eye is transplanted to the host of another species. If the eye is grafted in the adult *Amblystoma*, the pupil may never cease to react to light,

for the entire mechanism is localized in the eye. However, in most cases the pupillary reflex was temporarily lost from 10 to 30 days, beginning on the second to sixth day after operation. The interruption persists during the time when the greatest changes are taking place in the retina, and to a small extent, in the bulb as a whole.

Return of vision has been proved in more than 80 animals selected from all groups of experiments. In general, vision returns in larvae during the second month and in adults from 2½ to 3 months, according to age. In larvae the earliest it was ever observed was on the 48th day (a transplant). In one transplanted adult *Amblystoma* eye it was so rapidly recovered that vision was proved on the 38th day—a very unusual case. It shows how soon complete restitution can take place under the most ideal conditions. One case, that of an adult *Triturus* eye, illustrates the results of grafting the same eye three times. After the first operation return of vision was proved on the 81st day. After the second operation it returned on the 79th day and after the third it was observed on the 61st day.

In testing for vision extreme care was taken to eliminate olfactory, gustatory, tactile, and mechanical stimuli. The animal when tested was in a tightly covered glass aquarium resting upon a heavy-cushioned base (Stone, '30). Vision in the normal control eye was removed by excising that eye in most cases. In a few specimens (3 reimplants and 2 transplants—larval grafts) a light-proof covering of celloidin and lamp-black was placed over the normal control eye during the tests. Proof of vision, as in normal controls, was the repeated snapping reaction of the animal to a piece of dark rubber on the end of a wire moving about one to two inches from the outside of the aquarium. Further checks by the study of

serial sections in every case showed optic-nerve connection between the eye and the brain. A few animals, some with rotated eyes, gave repeated negative response as in the case of blind controls. A study of the serial sections in these specimens showed that the optic nerve failed to connect the eye with the brain.

#### DISCUSSION AND CONCLUSIONS

It is clear that the functional eye of the urodele can be readily grafted, even several times, with complete recovery of all its functions so long as it is placed in its normal environment, the orbit. It is also obvious that the nature of the degenerative changes that take place in the grafted eye, and the amount of regeneration required to bring about recovery depend upon the age of the host. The ability of the young eye to undergo transplantation with so little subsequent change in its structure, and the power exhibited by the adult eye to regenerate a new lens and retina after considerable destruction explain the high percentage of success in these experiments. The homoplastic transplantations seem to be about as successful as the autoplasmic (reimplanted) graft. Even between closely allied species (Stone, '30) the heteroplastic grafts are equally tolerated. Between the adults of more distantly related species (*A. punctatum* and *T. viridescens*) there appears to be incompatibility between host and graft tissues. This is not entirely mutual, however, because the *Amblystoma* eye upon *Triturus* can remain in good condition for several months. The reverse is not true.

It remains to be seen whether or not there are any groups of vertebrates in which the eye can be so successfully grafted as in the amphibians. The works of Blatt ('24) and Ask and Andersson ('27) in grafted eyes, and the experiments of Matthews ('33) on cutting the

optic nerve seem to give some evidence that the power of restitution in the operated eye in some of the fishes is not so great as in amphibians. The experimental work that we have begun in this class of vertebrates has also given us information that in *Fundulus* this is quite true. What differences there will be found in the various groups of fishes awaits further experimentation. There is no evidence existing at the present time.

Among the other classes of vertebrates there is also no satisfactory information on this score. What little has been done tends to indicate negative results in the grafting of the eye in the higher forms, for in them regeneration of lost parts in the more specialized tissues seems to be rather poorly developed. Favorable findings in the grafted eye of the rat were published by Koppányi ('23) but these results do not seem to have been corroborated. Our own unpublished experiments on more than 100 rats of various ages after birth indicate that anatomical heal-

ing in the grafted eye of the white rat is difficult to obtain. A reimplanted eye existing for about four months, one fourth of its original size, represented the best results in our series. The retina degenerated without the slightest evidence of recovery. However, the grafting of the eye of the mammal in general has not been investigated sufficiently to give an idea how much can be done. Therefore the results so far do not necessarily mean that better success is not possible in some other mammal.

The size of the eye and the part it plays in delaying the return of circulation to distant parts of the bulb is no doubt one of the important features which extends the degenerative changes to the point where restitution becomes impossible. It is quite possible that in only those animals which exhibit exceptional powers of regeneration can we expect the eye to survive an operation such as grafting.

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## THE INDIRECT TRAUMATIC OPTIC ATROPHIES

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### HISTORY

The condition with which we are dealing was recognized as long ago as in the time of Hippocrates, who mentions it in his *De Morbis Vulgaribus*, as follows: "Injuries to the eyebrow frequently cause blindness."

Our knowledge of the true cause of indirect traumatic optic atrophies, or those occurring as a sequel of craniocerebral injuries, dates from the middle of the last century, from the work of Chassaignac (1841),\* Galezowski (1872),\* and particularly of Berlin (1878),\* whose name is more familiar to us in connection with macular edema following eye contusions, known as Berlin's opacity. Berlin saw the significance of the observations of Von Hoelder who, by stripping the anterior-fossa dura routinely in the course of 40 years of autopsy observations, found 90 percent of orbital-roof and 73 percent of optic-canal fractures in fractures of the base of the skull. Up to that time blindness, generally unilateral, but sometimes bilateral, following head injuries, was either attributed to retinal concussion or believed to be caused reflexly from injury to the supraorbital or intraorbital branches of the fifth nerve. Although optic atrophies were observed to develop subsequently, this was thought to be the result of a nutritional disturbance following the "retinal anesthesia," which was considered the true cause. These cases of blindness were therefore ranged among the amblyopias and amauroses; that is, blindness without fundus pathology, a group which included hysterical amblyopia and amblyopia ex anopsia. The follow-

ing passages from de Wecker's<sup>2</sup> "*Thérapeutique oculaire*" published in 1878, on the eve of Berlin's brilliant observation, are of historical interest because they show that the phenomenon was not unusual and that it even then presented a problem in forensic ophthalmology.

Under "Amblyopia from traumatism," de Wecker writes: "The traumatic form follows especially in the wake of contusions of the eye (Testelin), of the head, or of the body. Of course, we do not count those cases in which such contusions were followed by an intraocular lesion. In our large treatise we have mentioned an example of contusion in a young worker struck by an iron wire, lacerating his left lower eyelid. This eye lost all direct reaction to light without at first showing any lesion of the optic nerve; but it ended in the development later of an evident atrophy."

Under "Simulation of amblyopia or of amaurosis," de Wecker says: "... the importance which attaches to such methods (of detecting simulation) may be seen from the expert opinion that has recently been requested of us, and of two other confrères, by one of our largest railway companies. An employee . . . received during train manipulations a lacerated wound of his left eyebrow, resulting in a deep scar. He declared that he was blind in the left eye as a result of this accident and demanded high damages from the company. True, ophthalmoscopy showed in that eye a fairly marked atrophy of the disk (pallor, narrowing of the vessels without a marked excavation). Exploration by means of test type with

\* Cited by Thorat.<sup>1</sup>

colored letters proved, however, undeniably that the patient exaggerated the impairment of the eye which had suffered the effects of contusion; and after he had read a part of the letters, with a colored glass placed before the eye whose visual acuity was perfect, we were enabled, by covering the eye which he said was amaurotic, to demonstrate to him that we were not misled by his false statements. We were thus able to inform the judge as to the extent of the injury to Mr. X's eye from the accident and to evaluate more or less correctly the material damages due him."

Considering that all the essential features of the syndrome were known to ophthalmologists in those early days, that is, an injury to head or eyebrow, sudden blindness, unilaterality, and subsequent simple optic atrophy, the failure of ophthalmologists to surmise that they were dealing with an interruption of optic-nerve continuity can, perhaps, be explained by the strangeness of the concept of a condition which we recognize today as a descending atrophy of the optic nerve.

It is interesting that on this side of the Atlantic, Noyes,<sup>3</sup> in 1881, who quotes Galezowski to the effect that 13 percent of optic atrophies are traumatic, wholeheartedly accepted Berlin's explanation. However, he still describes the indirect traumatic cases of optic atrophy under the designations amblyopia and amaurosis:

"Traumatic cases," he says, "have been denominated concussions of the retina. They may be caused by blows upon the globe or upon the orbit, upon the head, or by shocks to the vertebral column. A blow upon the eye by a blunt instrument may not cause any visible lesion of tissue, either without or within the globe, yet be followed by decided amblyopia. . . . An explanation is to be given of not a few cases which were brought forward by

Berlin in the Heidelberg Ophthalmic Congress, 1878, to the effect that fissure of the roof of the orbit is far more frequent than is generally supposed, and it extends often to the optic foramen or through the sphenoidal fissure. Traumatic amblyopia or amaurosis may occur through a great variety of injuries to the skull or brain, to which no clue can be found should the patient survive, but in which some disorganization of tissue undoubtedly has occurred to structures concerned in vision.

"Concussions of the spinal cord may cause loss of sight. I saw a man who, by a railway collision, received a sudden and severe blow upon the lower end of the spine, which had an effect such as would have been produced by a blow from above. He suffered extreme pain at the base of the skull, along the spine, while his sight was, as I remember, about 20/100 and the visual fields were contracted to an angle of about 30 degrees. In both eyes there was extreme hyperemia of the optic discs, both in the large and small vessels. For a number of weeks, the condition remained unchanged, and I do not know how it finally turned out. . . .

"I saw a case where a very large man fell into a hole in the street, and struck the outer edge of one orbit on the pavement. He lost sight in the eye of the injured side immediately, and after a few days the opposite eye became very amblyopic. In neither was any lesion to be seen by the ophthalmoscope. A fissure of the orbit might have extended to both sides. It is important to inquire for bleeding of the nose, and to search for subconjunctival ecchymosis, which may come to view several days after the injury. Both these signs would be strongly indicative of fissure, but would not be indispensable as symptoms."

In dealing with orbital injuries, he says: "Blows upon the margin of the orbit sometimes implicate the supraorbital or

the intraorbital nerve, and to this fact has been attributed the loss of sight which in some cases has been known to ensue. I once published such an instance. But I incline to withdraw from this opinion, and think the cause is to be sought for in fissure of the orbit reaching back to the optic foramen, as will be referred to later. This nerve injury has long had a place in ophthalmic pathology, but it stands on very weak evidence. . . .

"Another class of cases of orbital fracture are those in which no ordinary symptom of this lesion appeared, but in which, after an injury to the head, loss of sight occurs in one or both eyes, and with very slight symptoms in the fundus oculi. After a time the optic nerve may show signs of inflammation or of atrophy. Again there may be many cases of fracture running through the optic foramen, or the roof of the orbit, simultaneously with fracture of the base, or in some other regions of the skull. The profound injury sustained distracts attention from the state of sight, and we seldom know that it has been impaired, nor would the patient, perhaps, be able to tell us anything about it.

"Possessed of these facts it becomes intelligible why, after a fall on the head, total, or nearly total, blindness may ensue with, perhaps, no ophthalmoscopic lesions. Ultimately, signs of inflammation or of atrophy, or pigmentation of the disc may appear."

Following Berlin's observations, many contributions to this subject have appeared in the world's ophthalmic literature. These were summarized by Wagenmann,<sup>4</sup> who brought the subject up to the time of the World War and gathered a complete bibliography terminating with that period.

The World War, which has enriched our knowledge in so many fields of

ophthalmology, in particular in regard to direct and indirect injuries of the eye and direct injuries to the optic nerve and the visual pathways, has contributed little to our knowledge of indirect injuries to the optic nerve in canal and chiasm. La-grange,<sup>5</sup> in his atlas, deals almost exclusively with intraocular lesions and intraorbital lesions of the optic nerve observed during the World War. Von Szily<sup>6</sup> similarly deals primarily with direct injuries to the visual apparatus and mentions only two indirect optic-nerve and chiasm injuries: one from a fall, the other from a kick of a horse, that is, not war injuries but accidents. It would appear, therefore, that head injuries from shrapnel and bullets and hand grenades rarely give rise to indirect optic-nerve injury. Blessig<sup>7</sup> also seems to have observed it as an accident rather than as a war injury, and reports only one case, that of a carpenter who fell from a ladder from a height of 15 feet, landing on his right temple. In reporting the case, he says: "He bled from his nose. On becoming conscious he noticed that he could not see at all out of his right eye. There was also a right external rectus paralysis. There was no external evidence of the injury except large ecchymoses of the lids of both eyes." He points out that "such cases of indirect injury of the optic nerve may present a special interest from the forensic standpoint, since here the connection between the loss of sight (atrophy of the optic nerve) and the accident (skull injury) is not so evident as in injuries of the globe itself." The late Chaco War, between Bolivia and Paraguay, also seems not to have contributed any cases of indirect optic-nerve injuries. A variety of intraocular lesions and optic-nerve injuries from bullets, hand grenades, and shrapnel and from thorax compression, is reported by

Perez Porcel,<sup>8</sup> but he makes only one passing reference, without reporting the case, to an optic atrophy from a fall.

Nor do nonindustrial eye injuries in civil life seem to lead to a considerable incidence of simple optic atrophies. While Cohen<sup>9</sup> reports observation of three cases among 51 nonfatal cases of skull fractures, in 1917, Blakeslee<sup>10</sup> reports only two among 350 nonfatal cases from the same Harlem Hospital in the period of 1924-1929, and presumably from assaults rather than accidents. The following recent reports of isolated observations are also of interest:

Tokachirova<sup>11</sup> reports a case of optic atrophy observed 20 days after the patient struck his forehead against a post in the dark, accompanied by unconsciousness.

Azzena<sup>12</sup> reports the case of a 48-year-old shepherd who fell from a height of seven meters, landing on his occiput. He remained unconscious for several hours, and presented a hematoma of the left orbital region two days afterwards. There was immediate and complete loss of vision in the left eye, and optic atrophy was complete in two months. Rust-colored pigment granules were observed near the vessels on the disc. X-ray examination was negative for fracture of the skull. The author believes the immediate blindness to have been due to hemorrhage into the sheath with compression, and that the atrophy was due to an interstitial hemorrhage.

Barletta's<sup>13</sup> case was in a young girl, struck by the elbow of a companion while dancing. The contusion was in the right-temple region. She continued dancing, but later became unconscious, and died without recovering consciousness. Papilledema was noted before death. At autopsy no fracture was found, but the ventricles and the sheaths of the optic nerves were distended with blood.

#### THE MECHANISM OF THE INDIRECT TRAUMATIC OPTIC ATROPHIES

*The type of accident:* In going over the literature dealing with indirect optic atrophies from head injuries, one is struck by the extreme frequency with which falls from heights are mentioned as the accident. Von Hoelder\* found one third of his cases due to falls. In Leber's cases\* falls were responsible for as high as 90 percent. The case Haab<sup>14</sup> described in illustrating an atrophy resulting from interruption of the conducting power of the nerve fibers, originated from a fall on the head. The two cases Von Szily<sup>6</sup> mentions as having been observed in the World War (one from a fall, the other caused by the kick of a horse's hoof) and Perez Porcel's case<sup>8</sup> (also from a fall on the head) have previously been cited. Thorai<sup>1</sup> who reports six cases, has five recorded as from falls, one being bilateral. Brizais<sup>15</sup> reports two of his five cases as caused by falls. The Barkans<sup>16</sup> also listed two falls among their five cases. Rollet, Paufigue, and Levy<sup>17</sup> show a majority of seven among 10 cases due to falls from motor vehicles. Our series attributes 62 percent to falls. It is to be borne in mind that a fall may be the second stage of an accident described otherwise, and be the real cause of the head injury, as for instance when the accident is that of being thrown out of a car, or from a motorcycle.

Considering the great frequency of anterior-fossa fractures in most of the series of the cases published—90 percent in Von Hoelder's,<sup>4</sup> 80 percent in Rollet, Paufigue, and Levy's,<sup>17</sup> 80 percent in our series—and the predilection of the orbito-frontal region as the site of impact, the mechanism which suggests itself as distinctive of a fall is that of an antero-posterior flattening of the skull and a displacement of the mass of the brain. This

\* Cited by Wagenmann.<sup>4</sup>

result of the application of a blunt force to a skull unsupported at the other end is not the same as that of a compound skull fracture by a missile, or that occurring in motor-car accidents generally in which the skull is crushed and which contribute the major item among causes of accidents responsible for traumatic ophthalmoplegias (Davidson<sup>18</sup>).

*Optic-canal fractures.* As can be seen from the review of the literature, students of the subject have generally accepted, almost without reservations, a fracture of the optic canal as the cause of blindness after head injuries.

The three major contributions to the subject of optic-canal fractures, since the World War, are by the Barkans, by Rollet, Paufigue, and Levy, and by Lillie and Adson.<sup>19</sup> The Barkans report five cases, in several of which other ophthalmologists had diagnosed amblyopia ex anopsia (not uncommon in medicolegal cases), and say: "A further review of the literature shows varying statistical figures as regards involvement of the optic nerve, due to great variation in the nature of the material and the methods of examination. It is a paradox that over 22 such cases were diagnosed by us in ophthalmologic practice, in the short space of six years." They further say that "X rays have been up to the present of no avail in the type of case we are reporting."

On the other hand, Rollet, Paufigue, and Levy find X-ray examinations valuable and practicable, if made early, before the fissures fill up, and report positive X-ray findings principally in the upper and lower outer canal wall in 10 cases, the upper nasal being apparently immune. Würdemann,<sup>20</sup> however, says the upper nasal orbital wall is the most common site of fissures.

Direct evidence of fracture in the form of callus, disclosed at operation, has only recently been reported in two cases: one

by Lillie and Adson<sup>19</sup> and another by Clovis Vincent.\* In neither case does there seem to have resulted improvement in vision or field as a result of operation.

There is only one positive X-ray diagnosis of the narrowing of the foramen in our series, in case 27.

*Hemorrhages into sheath of optic nerve.* Aside from optic-canal fractures, as the cause of the optic atrophies, hemorrhages into the sheath of the optic nerve have been considered as a probable cause in a certain group of cases; namely, in those with partial atrophy and partial recovery of vision. Compression of the optic nerve by hematoma arising either directly in situ or by extension of the basal hemorrhage into the intervaginal space, has been considered as competent to give rise to a partial or transient optic nerve dysfunction. This, however, has found less acceptance as a mechanism among writers. Favory<sup>22</sup> and Terrien<sup>23</sup> believe, however, that intervaginal hemorrhages are more common than is generally supposed, and that they manifest themselves by fundus changes. Favory states that it can be diagnosed with certainty only in the presence of evidence of intracranial hemorrhage in the form of bloody spinal fluid. The characteristic findings, according to Favory, are: retinal hemorrhages, less commonly papillitis, which may be observed from one to three weeks after the injury and are due to compression of the central retinal vein at its exit from the nerve by the intervaginal hematoma, and the abolition of the direct light reflex. He finds that recovery of vision is general in spite of atrophy, that the mydriasis generally persists, and that there is often as a sequel, pigmentation around the papilla.

On the other hand, Von Szily<sup>6</sup> believes the retinal hemorrhages to result inde-

\* Cited by Hartmann.<sup>21</sup>

pendently of the intervaginal hemorrhage, which, according to him, is responsible for the papillitis only. Papilledema has been reported very rarely in this connection. Cantonnet\* reports however having observed cases of recovery or partial recovery even after papilledema. There is a suggestive frequency of nasal fractures in the partial-atrophy cases in our series.

*Skull deformation and brain displacement.* The difficulty in demonstrating a skull fracture in some cases, and particularly in order to explain the bilateral cases, or the chiasmal syndromes, have led Liebrecht† and more recently Coppez<sup>24</sup> to advance a third mechanism, namely, an anteroposterior skull compression widening the distance between the two optic foramina, to which the optic nerves are adherent, and thereby either splitting the chiasm in its middle, or tearing the optic nerve or the optic tract from the chiasm.

Malbran,<sup>25, 26, 27</sup> who has reported on four cases of chronic cisternal arachnoiditis resulting from trauma with chiasmal symptoms, is not even convinced that optic-canal fissures, because of the meager callus and rare displacement of fragments, are the cause of the atrophies, and doubts the agency of an intervaginal hemorrhage as competent to account for the atrophies although he admits the existence of both, but advances the hypothesis of a backward displacement of the brain mass, detaching the chiasm from one or both optic nerves. He bases his views on observations at autopsies of 42 cases of craniocerebral injuries, but believes Coppez's explanation valid in one case.

*The visual fields.* Both in the bilateral and unilateral cases have attempts been made to find characteristic bundle defects

in the visual fields of the indirect optic atrophies as an aid in their differential diagnosis. Only in a few of the unilateral cases—because of the high degree of visual impairment in the majority—running to about 75 percent to 80 percent—are visual-field studies possible. Wagenmann,<sup>4</sup> Würdemann,<sup>20</sup> and Thiel,<sup>28</sup> however, describe central scotomata and concentric contraction of fields in the severer impairments of vision, and upward field defects in the cases with partial losses. The latter are presumably due to the compression by intervaginal hematomata from below. The Barkans<sup>16</sup> say that "it is almost characteristic of the sector defects to be downward and outward," and that "a sector defect to and including the macular region is sufficiently characteristic to be almost pathognomonic." The two fields noted by Thorat<sup>1</sup> included one with a central scotoma and one with an upper-sector defect. Rollet, Pautique, and Levy<sup>17</sup> found central scotomata in the partial cases as well. The Lillie and Adson cases presented central and annular scotomata. Malbran,<sup>25, 26, 27</sup> in describing bilateral cases, reported bitemporal hemianopsias. Coppez<sup>24</sup> in bilateral cases found bitemporal hemianopsias and contraction, central scotomata, and lower nasal field defects. Our cases showed: upper nasal defects, temporal defects, lower defects, as well as central scotomata and concentric contractions. From this summary there does not appear to be any characteristic field defect either in the unilateral cases or in the bilateral cases, and the scotomata in the individual case appear rather diffuse. We are probably dealing with lesions too diffuse, both in the optic nerve and chiasm, to determine well-defined bundle involvement. It is not strange, however, to find this diffuseness if one considers the diffuseness of brain lesions in general in craniocerebral injury, and that the nerve and

\* Cited by Thorat.<sup>1</sup>

† Cited by Coppez.<sup>24</sup>

chiasm involvements probably bear the same relation to the canal fracture or intervaginal hemorrhage and lacerations which the brain lesions bear to skull fracture and other intracranial damage resulting from head injuries.

#### THE MEDICOLEGAL PROBLEMS

While the literature on the subject of indirect optic atrophies from head contusions, as has been pointed out, dates from Hippocrates, and injury to the optic nerve as the cause, even in the case of minor head contusions, has been recognized for six decades or more in forensic ophthalmology, lawyers are in the habit of demanding positive proof and lay referees are occasionally not impressed with presumptive evidence alone. Moreover, standard textbooks and the literature do not sufficiently cover the medicolegal problems that arise, and many points in the life history of the syndrome are not emphasized.

A review of 42 cases of indirect optic atrophies from head injuries encountered in the course of 20,000 examinations of claimants for compensation for eye injuries in the past 6½ years seemed therefore indicated in order to call attention to their relative frequency and because of the light they may throw on the recurring medicolegal problems. Only cases not obscured by intraocular lesions (detachments, thrombosis, occlusion, and hypertension or macular lesions) or by intraorbital lesions (cellulitis) and presenting either unconsciousness or a positive X-ray diagnosis were selected for tabulation. Altogether, the group selected and the numerically equal group excluded, the group of traumatic ophthalmoplegias already dealt with,<sup>18</sup> the small group of retrochiasmal involvement, and the cases still in process of observation, all resulting from injuries to the head rather than to the eye, constitute 1 per-

cent of the ocular examinations for the period. This small percentage, however, accounts for an extremely high compensation cost.

When a worker has had a head injury, has been either unconscious or presents a positive skull fracture by X-ray examination, or both, and there is a record of immediate blindness in one or both eyes and unilateral or bilateral optic atrophy is found soon afterwards, there is usually no room for medicolegal controversy. Even in cases that are not so clear cut, there would be little ground for conflict of opinion, if we had a routine preemployment and periodic eye examination of workers in industry by ophthalmologists; or, in lieu of that, a fundus examination after a head injury as early as practicable, regardless of its apparent mildness.

The occasional preemployment examination of the eyes amounts generally to a mere record of visual acuity, without a refraction or fundus examination. Our records indicate that only eight of the patients in the 42 cases tabulated had had a fundus examination, of record, within three weeks after the head injury.

Under the circumstances, certain issues frequently give rise to controversies in the administration of the Workmen's Compensation Act in relation to optic atrophies.

*The normal interval between a head injury and an optic atrophy.* The standard textbooks are not quite definite enough on the subject. Fuchs<sup>20</sup> says that "it takes some time, several weeks at least, and usually longer, for the degeneration of nerve fibers to travel from the point where the break is situated down to the papilla." Wagenmann<sup>4</sup> finds that it is usually seen in three weeks, but cites a case in which it was observed as early as within six days. Würdemann,<sup>20</sup> who utilizes principally Wagenmann's digest

INDIRECT UNILATERAL TRAUMATIC OPTIC ATROPHIES \*

No.	Name and Occupation	Age	Year of Accident	Nature of Accident	Unconscious	Injury and X-Ray Findings	Eye Involved	Atrophy First Noted	End Result in Visual Acuity	Lues	Remarks
1	T. F. Cust. engineer	39	1927	Fell four stories from window	Yes	Occipital fracture	O.D.	Eight years	20/60		Central scotoma, contracted field, right-sided deafness
2	S. A. Carpenter	47	1927	Struck by wooden horse, thrown against beam and spike	Yes	Laceration right forehead X-ray film negative	O.D.	Eight months	20/100		Upper temporal chorioretinal scar. Contracted fields
3	M. C. Excavator	40	1929	Felled by timber and fell 20 feet	Yes	Compound right frontoparietal fracture	O.D.	Five weeks	L.P.		
4	B. M. Engineer	33	1930	Recoil of spring in vise, cut face	Yes	Fracture right frontal and malar	O.D.	Four months	No L.P.		
5	O. F. Ironworker	30	1930	Struck by load of steel	Yes	Laceration right temple, fractured skull	O.D.	One year	L.P.		Ptosis. Loss of sense of smell
6	A. L. Carpenter	21	1930	Fell ten feet	?	Nasal fracture	O.D.	16 mos.	20/20		Secondary atrophy? sluggish pupil
7	N. W. Engineer	58	1930	Thrown off ladder	Yes	Contusion right temporo-parietal region. Vomited blood	O.D.	Six weeks	L.P.	Con-genital	Interstitial keratitis and central choroidal lesions, O.U.
8	P. M. Tinsmith	38	1931	Head caught between doors of elevator	Yes	Compound left frontal depression fracture, ecchymosis and chemosis	O.D.	16 days	L.P.		Retinal edema. Note contralateral involvement
9	S. P. Boilermaker	26	1931	Boiler explosion	?	Fractured skull and left zygoma	O.D.	Three months	L.P.		Note contralateral involvement
10	P. G. Fireman	43	1931	Fell 12 feet	Yes	Right zygoma laceration, and fracture?	O.D.	Nine months	20/33		Central scotoma
11	N. V. Subway worker	42	1932	Fell from ladder to platform	?	Skull fracture	O.D.	Three months	No L.P.		
12	M. C. Cab driver	36	1932	Assaulted by passenger	Yes	Laceration of right upper lid and fractured skull	O.D.	Three months	L.P.		
13	M. G. Window cleaner	50	1932	Motor-car accident	Yes	Fracture of right orbit	O.D.	Four weeks	L.P.		Enophthalmos
14	E. M. Rent collector	33	1934	Hit by baseball bat	Yes	Laceration over right eye, fissure fracture of right frontal	O.D.	Six weeks	L.P.	Plus	
15	E. E. Baker	27	1935	Thrown out of truck by tire blowing out and overturning car	Yes	Laceration right temple and lids; fractured skull	O.D.	Eight months	20/66		Temporal pallor and temporal-field contraction

\* Cases 1 to 18 involved the right eye, cases 19 to 37 involved the left eye.

INDIRECT UNILATERAL TRAUMATIC OPTIC ATROPHIES \* (Continued)

No.	Name and Occupation	Age	Year of Accident	Nature of Accident	Unconscious	Injury and X-Ray Findings	Eye Involved	Atrophy First Noted	End Result in Visual Acuity	Lues	Remarks
16	J. B. Carpenter	38	1935	Fell 13 feet	Yes	Lacerated right forehead X-ray film negative	O.D.	One year	L.P.		Psychosis later developed?
17	I. P. All-around helper	18	1936	Fell from freight car to ground	Yes	Fracture of left parietal and temporal and right sphenoid	O.D.	Six weeks	L.P.		Total ophthalmoplegia, 5th and 7th nerve involvement, and pulsating exophthalmos. At first, O.S. ophthalmoplegia external, which cleared up
18	F. O. K. Engineer	48	1937	Fell from scaffold thirty feet to rock	Yes	Right frontoparietal lacer. Fracture greater wing of right sphenoid, 6 days later subconjunctival hemorrhage O.D.	O.D.	Less than six weeks	L.P.		Field defect below to fixation point, contracted elsewhere
19	P. S. Riveter	28	1930	Fell from girder to street	Yes	Fractured skull	O.S.	Three months	L.P.		
20	J. R. Bricklayer	35	1930	Fell 35 feet	Yes	Laceration of face, fractured skull and left orbit	O.S.	Four months	No L.P.		
21	P. G. Shipping foreman	41	1930	Hose flew back and struck left cheek	No, Lost 2 days only	Fractured left temporal bone and left zygoma	O.S.	One year	L.P.		Lens subluxation
22	J. G. Stonesetter	45	1930	Fell 20 feet	Yes	Laceration of left forehead, fractured skull	O.S.	Six days?	No L.P.		
23	J. F. H. Lineman	29	1931	Fell off truck	Yes	Laceration of face, fractured roof left orbit	O.S.	One month	L.P.		
24	J. S. Truckman	38	1931	Fell from window to sidewalk	Yes	Laceration of scalp, fracture of vault	O.S.	One year	L.P.		
25	A. B. Laborer	33	1931	Fell off truck	Yes	Fracture of left temporoparietal	O.S.	Seven weeks	20/30		Normal pupils and fields
26	G. D. Painter	42	1931	Fell 14 feet	Yes	Laceration of scalp; subconjunctival hemorrhage on left; fracture of right nasal bone; lacer. left eyebrow; teeth knocked out	O.S.	Six weeks	20/33 Improved from 20/300 in 5 mos.		Nasal elevation of disc? Pupils sluggish
27	M. V. Building trade	?	1934	Struck by piece of frozen dirt from height of 20 feet	Stunned	Hematoma over left eye, fracture left optic foramen	O.S.	Six weeks	L.P.		Five months before accident record of 20/20 in O.S.
28	N. Z. Painter	45	1934	Struck by taxi	Yes	Fractured left frontal and roof of orbit	O.S.	Two months	20/100		
29	A. K. Off. cleaner	26	1934	Fell down flight of stairs	Yes	Bruises and contusions of buttocks, left arm, and right leg. X-ray film negative	O.S.	13 days	L.P.		

\* Cases 1 to 18 involved the right eye, cases 19 to 37 involved the left eye.

## INDIRECT UNILATERAL TRAUMATIC OPTIC ATROPHIES \* (Continued)

No.	Name and Occupation	Age	Year of Accident	Nature of Accident	Unconscious	Injury and X-Ray Findings	Eye Involved	Atrophy First Noted	End Result in Visual Acuity	Lues	Remarks
30	Th. H. Elevator operator	?	1935	Assaulted	?	Black eyes, nose bleeding, fracture of both nasal bones and left zygoma	O.S.	Nine days	L.P.		
31	S. P. Painter	52	1935	Struck head on archway while riding in tunnel	Yes	Laceration over right eye, fracture of right lower parietal and temporal bones extending into skull base	O.S.	Six weeks	20/20		Note contralateral involvement
32	N. P. Helper	18	1935	Tire explosion	Yes	Fractured nose, right frontal sinus, and anterior fossa	O.S.	Five weeks	20/40 Improved from L.P.		Bilateral anosmia, choroidal rupture, Pupil normal. Lower nasal blurring of disc. Upper nasal field defect
33	P. B. C. Riveter	49	1935	Struck by woodblock	No. No time lost	Fracture of left frontal ? Irregular lower orbital margin	O.S.	Ten days	L.P.	Plus	
34	G. F. Timberman	33	1935	Struck by rock from 40-ft. height	Yes	Compound fracture of left frontal into orbit and left parietal	O.S.	Two months	No L.P.		Hypheemia, O.S., recorded first day. No direct or consensual reaction
35	A. D. Building trade	31	1936	Fell from scaffold 45 feet	Yes	Laceration over left eye, fracture anterior fossa	O.S.	Six days	L.P.		
36	E. E. Carpenter	38	1936	Fell off bridge	Yes	Bleeding from left ear and nose; laceration and hematoma over left eye. X-ray film negative	O.S.	Seven weeks	No L.P.		
37	B. S. Baker	?	1936	Motor car accident	Yes	Laceration both upper lids and nose. Fractures of both frontal, parietal, and upper jaws.	O.S.	Six months	20/30		

\* Cases 1 to 18 involved the right eye, cases 19 to 37 involved the left eye.

## INDIRECT BILATERAL TRAUMATIC OPTIC ATROPHIES

No.	Name and Occupation	Age	Year of Accident	Nature of Accident	Unconscious	Injury and X-Ray Findings	Eye Involved	Atrophy First Noted	End Result in Visual Acuity	Lues	Remarks
38	R. L. Auto worker	39	1926	Fell 3 stories	Yes	Laceration of left forehead, fracture of skull?	O.U.	Ten years	O.D. 20/25 O.S. L.P.		O.S. partial atrophy. Normal pupils
39	P. M. Subway laborer	31	1930	Fell off scaffold into excavation	Yes	Skull fracture and other injuries	O.U.	One year	O.D. 20/25 O.S. 20/20-3	?	Bilateral Argyll Robertson pupil
40	Wm. S. Iron worker	31	1931	Fell off scaffold 30 feet	Yes	Depressed left frontal and base fracture	O.U.	Six weeks	O.D. 20/25 O.S. L.P.		O.D. Temporal contraction. Normal pupils O.S. Enophthalmos
41	W. G. Building trade	49	1931	Fell 3 stories from window	Yes	Left frontal fracture	O.U.	Six months	O.D. 20/25 O.S. 20/100		Bilateral Argyll Robertson pupil
42	M. L. Auto worker	41	1936	Fell while working	Yes	Hematoma over left eye	O.U.	Sixteen days	O.D. L.P. O.S. 20/25	Plus	Bilateral Argyll Robertson pupil O.S. unchanged after one year observation

of the literature, bringing it up to 1917 only, speaks in one place of "six or more weeks" and in another place of "two to three months," although in several of the cases cited, it was noted as early as within 10 days. Genet<sup>30</sup> finds that the evolution toward atrophy begins about the tenth day. Rollet<sup>31</sup> reported a case following a thorax compression in which optic atrophy was noted 11 days after the injury, and noted that up to 1931 only 10 cases had so far been published. Rollet, Paufigue, and Levy<sup>17</sup> say that atrophy begins during the second week; the Barkans,<sup>16</sup> that "Pallor due to descending atrophy may be observed from the second week on." Blakeslee<sup>10</sup> reported: "The nerve head rapidly changed in appearance and within a few days showed extreme pallor."

Our own cases include two atrophies seen on the sixth day, two on the tenth day, three in three weeks, 12 in six weeks, and eight in 12 weeks. Twenty-seven cases, or 75 percent, showed atrophy within three months. The first observation or record, of course, does not mean the first appearance, and the cases with very much longer intervals are obviously such only because no earlier examinations had been made, or had not been recorded. One may, therefore, say that an interval of six days between a head injury and a beginning optic atrophy does not necessarily argue for a preëxisting optic atrophy, and that an optic atrophy appearing within three months is reasonably attributable to the head injury itself. After three months we may still be dealing with a slowly developing chronic arachnoiditis due to a head injury, late intracranial hemorrhages and abscesses resulting from a craniocerebral injury.

*Demonstration of basal fracture by the X ray.* That a severe injury to the brain may result in the absence of a skull fracture is common knowledge. It is also well

recognized that basal fractures are often undetected by radiography. The literature cited indicates that these statements are particularly true in regard to optic-nerve injuries following head injuries. The fact is that in the two cases reported by Lillie and Adson<sup>19</sup> only recently, the X-ray films of the skull were negative, and only later—seven weeks in one case and six months in the other—was narrowing of foramina by callus demonstrated, and in one case proved at operation. Keyes<sup>32</sup> and Pfeiffer\* have pointed out the pitfalls in optic-foramen radiography. Our own efforts to get clinically clear-cut cases of optic-foramen fractures confirmed by the X ray have been successful in only one case.

It is therefore with justice that Dorman<sup>33</sup> writes as follows:

"A blow of great force but of small impact, such as may be produced by a small hammer, may cause a simple or compound depressed fracture of the skull, with or without an accompanying contusion of that portion of the brain lying directly under the area fractured. Widespread and remote contusion and laceration of the brain seldom results from an injury of this nature. A blow of less force but of larger impact, such as a head striking the pavement, on the other hand, may cause very little damage at the point of impact, yet extensive and remote contusions and lacerations of the brain may result," and that "it is a mistake from the standpoint of compensation to base the degree of disability upon the X-ray findings alone in head injuries. . . ." In our series, 33 out of 42 cases showed positive X-ray findings, although no details as to site of fracture were recorded in several.

*The problem of unconsciousness.* The third issue is the question of unconscious-

\* Cited by Keyes.<sup>32</sup>

ness in dealing with head injuries. Unconsciousness is probably a more reliable guide to the extent of brain injury than the demonstration of a skull fracture. Yet in our series, while in 34 a history of unconsciousness was available, there were two cases (21, 33) without unconsciousness and without loss of time; and reliable observations of optic atrophies from head injuries without it are reported in the literature. Eichert,\* in 1903, reported such a series gathered from Wagenmann's clinic. Thorall<sup>1</sup> reported six cases in which optic atrophy followed a light head injury, only one of them accompanied by unconsciousness. He remarked that "the injuries are mainly violent blows or gunshot with cerebral symptoms—unconsciousness—and bleeding from cranial orifices; some are light injuries on orbital margin or anterolateral face, and some are without cerebral symptoms." Rollet, Paufigue, and Levy<sup>17</sup> reported one case without unconsciousness. Genet<sup>30</sup> also stated that "at times, there is no loss of consciousness, frequently no bleeding or escape of serous fluid from ear or nose, and yet the optic atrophy reveals a fractured orbit."

*The problem of the chiasmal syndrome and bilateral optic atrophies.* Bilaterality of ocular involvement *a priori* creates an adverse judgment in relation to an injury as cause, unless very obvious. Lues, tabes, multiple sclerosis, regional neoplasms (hypophysis, suprasellar, frontal lobe, optic nerve, and chiasm), vascular lesions, tubercular meningitis, and sinusitis are so predominantly responsible for bilateral atrophies, and the head-injury optic atrophies are so predominantly unilateral, that there is cause for hesitancy. Wagenmann<sup>4</sup> reported the much rarer bilateral traumatic optic atrophies, both

primary and secondary. For the first, which are sudden in onset, he assumed either a bilateral fracture of the foramen, fracture of the sella, or compression by a basal hemorrhage. For the secondary atrophies, which appear late and develop slowly, he considered secondary intracranial hypertension, cerebral, meningeal, vascular, and osseous processes, scar formation, and callus. They are initiated by papillitis or more rarely, choking, or still more rarely, by retinal involvement. The original injury, however, must be rather severe, he thought. The possibility, in addition, of aggravation of a preëxisting lues or tabes, neoplasm, multiple sclerosis, tuberculosis, sinusitis, is also to be considered.

In 225 optic nerve lesions among 268 basal fractures, Cantonnet\* found in 7½ percent a bilateral involvement of the optic nerve. The majority of the bilateral cases, however, terminated in partial or complete recoveries, with over a third complete recoveries. In the unilateral group, however, only a little over 28 percent made partial or complete recoveries, the complete recoveries amounting to only 2 percent. In our own series, 12 percent were bilateral, with partial atrophy in one eye and total in the other.

In Cantonnet's series, 4 percent of the unilateral optic atrophies were contralateral, while in our series, 7.5 percent were contralateral. There was only one apex syndrome or involvement of the optic and sphenoidal foramina simultaneously.

Reports of bilateral cases in the literature are not many, and the problems presented by them from a differential diagnostic standpoint are so serious that the following cases which have appeared lately deserve a brief recapitulation:

Christiansen<sup>34</sup> pointed out the difficulties of differential diagnosis of suprasel-

\* Cited by Wagenmann.<sup>4</sup>

\* Cited by Thorall.<sup>1</sup>

lar tumors à propos of the following case:

The Superior Council of Workmen's Compensation referred a patient for a report on the causes and prognosis of the symptoms. A year and one half before, a railroad worker, while making up a train, was violently struck on the root of the nose by the coupling pin of a car. He was thrown to the ground but did not lose consciousness. There was no fracture either of the nose or of the cranium. He continued working in spite of violent headaches. Several days later he noticed diminution of vision in his right eye, and 10 days later he was completely blind in that eye. Some days later he noticed that he could not see well temporally out of his left eye. Examination by an ophthalmologist took place only a year after the accident. He found marked atrophy of the right eye, less marked atrophy of the left eye, with complete temporal hemianopsia. Repeated eye and X-ray examinations during seven months showed no progression of symptoms, and a tumor was easily excluded. The diagnosis was a slow and progressive subdural hemorrhage, rather than a fracture, involving all the fibers of one eye, and the crossed fibers of the other eye. In the latter case the effects would have been instantaneous in his opinion.

Gordon Holmes,<sup>35</sup> reported the following case of chronic basal arachnoiditis, in his paper on "Suprasellar tumors," as a condition that may produce symptoms similar to those of suprasellar endo-theliomata. An officer, 49 years of age, with a history of ptomaine poisoning in 1916, had received a severe blow on the head in February, 1917. Four months later vision of both eyes began to fail gradually. When examined by Holmes, there were bilateral, temporal paracentral scotomata extending up to the fixation point, and great contraction of the right

central field. The optic disc was slightly pale. In September, 1919, the patient saw only a moving object in the nasal field of the right eye, and read less than 3/60 with the left. There was a negative Was-sermann test and a negative X-ray examination of the sella. At operation, the piaarachnoid was opaque and thickened around the chiasm, and a considerable amount of fluid evidently under pressure escaped on incising it. Vision was described as almost normal when the patient was last heard of three years later.

Malbran's<sup>25, 26, 27</sup> reported four cases of traumatic chiasmal arachnoiditis, the latest two of which are: The case of a laceration of the right side of the forehead sustained in an automobile accident with unconsciousness. There was complete recovery, except for a right optic atrophy, which was noted on the twentieth day after the accident, and progressed rapidly to complete blindness. X ray of skull including the optic foramina was negative. Neither the patient, nor the ophthalmologist who had examined him, was aware of any disturbance of the left eye until Malbran took his fields two months later, and discovered a complete loss of the lower nasal fields. The direct reaction to light was preserved. In the last, Malbran reported a chiasmal syndrome; a lower-nasal field defect in the left eye, a bitemporal hemianopsia resulting from a head injury sustained in a motor car which plunged down a precipice, a depressed left frontal fracture, and such other involvements as fracture of left malar and temporal bones, anosmia, polydipsia, polyuria, deafness, and disturbance of the trigeminus. The eye findings seven weeks later were bilateral pallor, blurred disc margins, wooly patches covering the veins ("Purtscher's" ?). Transcranial operation revealed a yellow, blood-stained membrane, which, when opened, produced

a gush of cerebrospinal fluid. Both vision and field improved slightly after operation.

Needless to say, the possibility of latent nontraumatic intracranial conditions, pointed out before, has to be considered even in connection with brief intervals between injury and atrophy. It is, however, in relation to the bilateral cases and cases with long intervals, that the problems in differential diagnosis are most serious. Errors in diagnosis are, however, minimized by our policy of observing many of our cases for as long as three years, in order to rule out progression and extension to the other eye, circumstances which would generally argue for a nontraumatic, sole, or contributing cause.

Only three cases of lues are recorded among 37 unilateral cases, and two among the five bilateral cases of our series, one being doubtful.

#### CONCLUSIONS

From a review of the literature and an analysis of 42 cases of indirect traumatic optic atrophies, the following conclusions are justified:

1. The condition may properly be described as a syndrome involving a certain type of accident, namely, falls from heights, and an evolution with immediate blindness, abolition of the direct reaction to light, without fundus changes at first, and optic atrophy in from one to three weeks.

2. It is the result of accidents, principally industrial, among workers engaged in the building trade, in which falls

are likely, rather than of compound skull fractures or of war injuries.

3. The bilateral cases and the chiasmal syndromes are probably a more common but easily overlooked condition; lues and other intracranial pathology are factors to be considered in the bilateral cases, principally.

4. The field defects observed suggest a diffuseness of optic-nerve and chiasmal lesions rather than isolated bundle defects; the relation between the foramen fracture and the optic-nerve lesions is apparently the same as the relation between skull fracture and brain injury in general, and is not determined by the site of fracture; contralateral involvement is not rare.

5. The apex syndrome, that is, involvement of optic foramen and sphenoidal fissure simultaneously, is rare, and when present it is the sixth nerve that is most frequently involved.

6. All unilateral optic atrophies, remaining so under long observation and following a head injury, even minor, are to be regarded as the result of the head injury regardless of X-ray findings or history of unconsciousness.

7. In industry, in the absence of routine preemployment and periodic eye examinations, an early inquiry into the condition of the eyes after every head injury, irrespective of its mildness, is essential not only for diagnosis and prognosis, but for the elimination of medico-legal controversies and of prevention of miscarriage of justice.

80 Centre Street.

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## THE CLINICAL SIGNIFICANCE OF THE RETINAL CHANGES IN THE HYPERTENSIVE TOXEMIAS OF PREGNANCY\*

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The toxemias of pregnancy produce a series of remarkable changes in the retina. This fact accounts for the many ophthalmic contributions to the literature on this subject, among the more recent of which are interesting articles by du Toit,<sup>1</sup> Wagener,<sup>2</sup> Bruce,<sup>3</sup> Van der Grift,<sup>4</sup> and Hallum.<sup>5</sup> The excellent works of Mylius<sup>6</sup> and Friedenwald<sup>7</sup> are commented upon by Wagener.<sup>2</sup> These, and the studies of many others, have resulted in the accumulation of much important and practical knowledge that is of very material benefit to the patient and to the physician who is confronted with the problems presented by a case of a toxemia of pregnancy. Obstetricians are becoming more aware of the valuable prognostic assistance that they may receive from the ophthalmologist. The necessary obstetrical individualization may be more comprehensively carried out when the ophthalmologist has made a careful analysis of the various types and degrees of retinal participation in these disturbances of pregnancy.

The purpose of this paper is to report the findings in 39 cases of hypertensive toxemia of pregnancy observed in the obstetrical wards of the Temple University Hospital from June, 1934, to January, 1937, and to discuss the significance of the various changes in this group, observed with the ophthalmoscope. The observations and conclusions, arising from this study are essentially those presented in the teachings of Wagener.<sup>2</sup> Not infrequently there is a disproportion between the severity of the clinical picture and the

severity of the retinal picture. It is in these cases that the retinal study is most valuable, inasmuch as the evidence of impending trouble is frequently obtained in the retina before the severe clinical manifestations develop. Furthermore, clinical study teaches that symptomatic improvement frequently is unreliable evidence that the inherent vascular disease is improving.

### ATTENUATION

The term is used to designate the uniform narrowing of the arterioles. The vessel that is attenuated departs from the normal appearance in two respects: (1) in mild cases it becomes reduced by about one third of its normal, visible, cross-section width; in more severe cases, to about three fourths its width. (2) There is an accentuation of the brightness of the light reflected from the center of the arteriole (fig. 1). Attenuation of the retinal arterioles is usually the first visible sign of the disease, taking place in the nasal retinal arterioles prior to the changes observable in the temporal retinal arterioles. It occurs at first in the extreme periphery of the retinal vascular tree and gradually, as the disease progresses, involves the vessel closer and closer to the optic disc. In the milder toxemias in which the diastolic blood pressure remains in the vicinity of 90 mm. Hg, only the peripheral one fourth of the nasal retinal arteriole becomes attenuated. The changes of attenuation are usually visible approximately at the time that the diastolic blood pressure becomes elevated to 90 or 95 mm. Hg. It seems justifiable to assume that this vascular phenomenon is only a local manifestation of the diffuse increased arteriolar tonus of all, or of a large part, of the systemic

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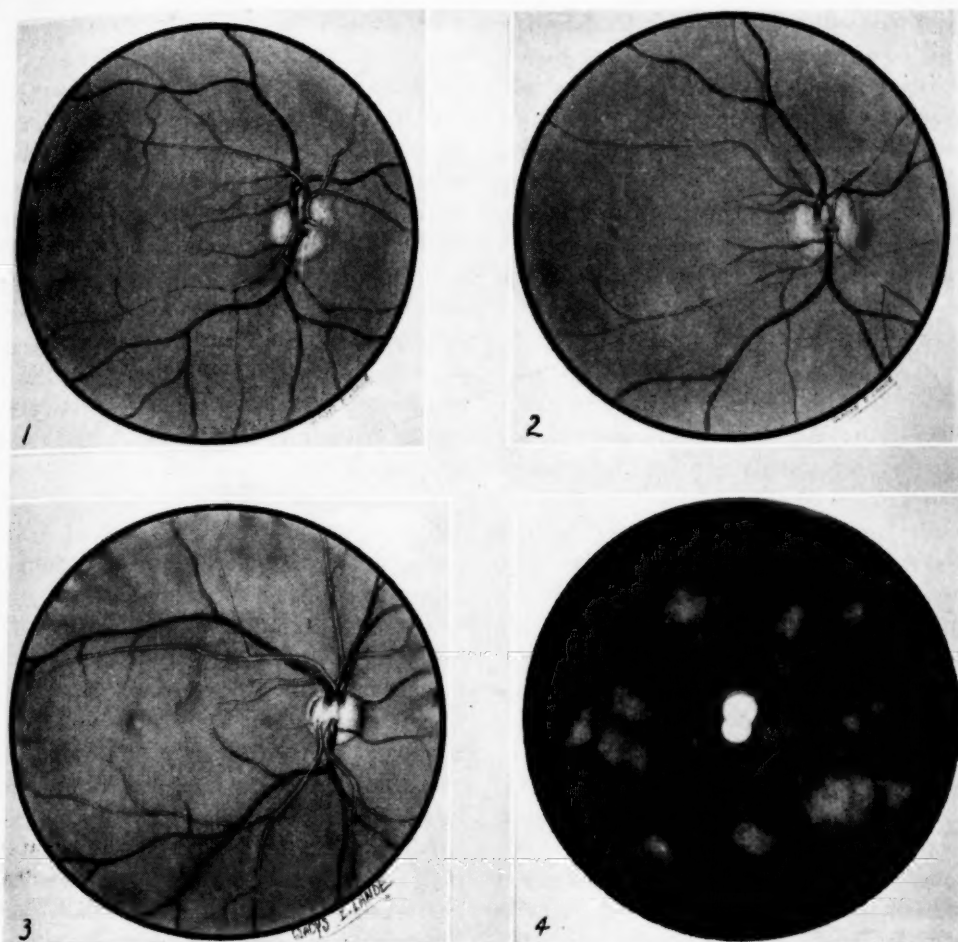


Fig. 1 (Gibson). Attenuation of retinal arterioles. There is generalized uniform narrowing of the caliber of the retinal arterioles with accentuation of the reflex stripe. This is the preorganic change as seen in case 1.

Fig. 2 (Gibson). Retinal arteriolar spasm. Notice the localized marked constriction in the retinal arterioles as seen in severe vasospastic preorganic vascular disease as in case 3.

Fig. 3 (Gibson). Retinal arteriolar sclerosis hypertensive type, grade 1. Localized narrowing of the caliber of the retinal arterioles is the sign of hypertensive sclerosis of the retinal arterioles as seen in case 2.

Fig. 4 (Gibson). Angiospastic retinitis. Fundus photograph of severe angiospastic retinitis as seen in case 6.

arteriolar tree. In those cases that are controlled satisfactorily, the attenuation will entirely disappear and leave no residual evidence of its presence after delivery. Once attenuation is present, it usually persists until the pregnancy is terminated, although frequently the degree of attenuation diminishes as the patient responds to treatment.

#### ANGIOSPASM

Angiospasm is the term used to designate that form of vascular change in which the narrowing becomes so marked that it results in a complete or almost complete occlusion of the vessel (fig. 2). It probably represents the maximum degree of attenuation.

In the angiospastic area the vessel will

appear as an indefinite ill-defined line in which the column of blood is practically indistinguishable. Unlike attenuation, however, this change may occur in any part of the arteriole first. Occasionally, angiospastic changes are observed near the disc; again, midway or in the periphery of the arteriole. In the more severe cases one or more of the arterioles may be completely involved in an angiospastic change. These changes are much more transitory than are those of attenuation, particularly in the milder cases in which they occur. Angiospastic changes are frequently associated with retinal edema or retinitis in that part of the retina supplied by the angiospastic vessel. It is sometimes necessary to study the arterioles very closely in order to determine whether the apparent narrowing of the vessel is due to an actual arteriolar narrowing or to the obscuring of the vessel by an edematous retina.

#### SCLEROSIS

When the arterioles have been subjected to an increased tonus for a sufficiently long period of time, for the given individual, actual sclerosis of the arterioles develops. With this appearance the patient passes from the preorganic to the organic stage of the disease. Due to the variability of the blood pressure from month to month, from day to day, and from hour to hour, and due to the extreme variability of individual tolerance for hypertension, it is difficult to postulate when sclerosis will occur. The increased cellular formation of sclerosis in the arteriole may be recognized ophthalmoscopically when the wall becomes sufficiently thickened to encroach on the lumen of the vessel (fig. 3). The indication of the degree of sclerosis is the amount of narrowing that occurs in the area in which the lumen is diminished. This occurs so characteristically that it is usually possible to grade the degree of

sclerosis as minimal, moderate, marked, and maximum by the amount of indentation that occurs. In the minimal, or grade-one, the narrowings are just barely discernible. To appreciate this change one must observe the arteriole from the disc to the periphery and scrutinize every detail of the vessel. In the moderate degree of sclerosis these changes are more frequent and more obvious. In the marked degree of sclerosis these changes are so severe that the arterioles appear to be very narrow and the walls of the vessel become visible where it is thickened.

#### RETINITIS

The occurrence of a combination of edema, hemorrhages, and exudates in the retina is referred to as retinitis. When this combination of retinal findings is found together with hypertensive vascular disease in a patient who is pregnant or in the puerperium, the ophthalmologist may make a diagnosis of retinitis of a toxemia of pregnancy (fig. 4). The retinitis may be the result of a hypertension that existed previous to the present pregnancy or it may be the result of the disease that has occurred since the pregnancy began. Many writers ascribe the presence of the retinitis to a toxic condition, while others attribute it to vascular changes. The frequent association of retinitis with vascular attenuation and spasm, and the lack of parallelism between the occurrence of retinitis and the degree of toxemia make it seem justifiable to assume that the functional vascular changes might also be an important factor in the pathogenesis of the retinitis. Occasionally one sees an incomplete macular star of the type formerly described as albuminuric retinitis.

#### STAGES

A patient affected with this disease may be in one of four stages: the preorganic, the organic, the latent, and the terminal. Usually the retinal picture is characteris-

tic for each stage. The preorganic stage is, as the name implies, the stage of the disease that occurs before sclerosis develops. It is recognized ophthalmoscopically by the presence of attenuation or angiospasm without retinal arteriolar sclerosis. The majority of treated cases will remain in the preorganic stage. The object of the treatment is to terminate the disease without leaving any residual vascular damage.

If, however, sclerosis occurs, the patient is classified as in the organic stage. This may occur during or after the pregnancy. Once sclerosis develops the process is irreversible.

The latent stage of the disease is that period which lasts for several years after the pregnancy. During this time the patient may be essentially symptomless. The blood pressure may be normal or slightly elevated. During this time, however, the sclerosis in the damaged vascular system continues to become progressively more advanced. This stage may last from about 4 to 12 years. It may be recognized ophthalmoscopically by the sclerosed vascular tree associated with peripheral pigment scars of characteristic size and distribution in the periphery of the fundus (fig. 5). These scars are the retinal remnants of the previous retinitis of the toxemia of pregnancy. When the slowly progressive sclerosis becomes so severe that vascular function is inadequate in the various vital organs, the patient passes from the latent to the terminal stage.

The terminal stage may simulate chronic nephritis, malignant hypertension, or hypertensive encephalopathy. The symptomatology is dependent on which of the vital systems is predominantly affected by the diffuse vascular disease. The retinal picture will constantly reveal the severe vascular involvement and frequently this is associated with a retinitis that closely simulates the retinitis of malignant hypertension. If the ophthalmolo-

gist finds the peripheral pigment scars of a previous retinitis of toxemia of pregnancy, he may frequently determine the exact nature of the process (fig. 5). Soon-

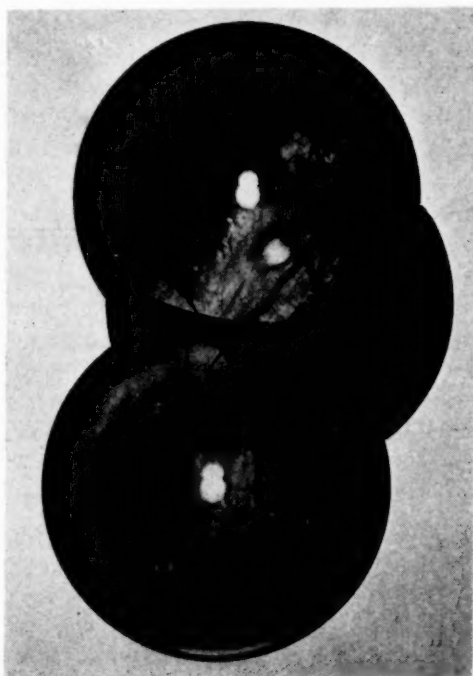


Fig. 5 (Gibson). Terminal retinitis of a previous toxemia of pregnancy. There are marked sclerosis of the arterioles, edema of the disc, cotton-wool exudates, hemorrhages, and, in the lower periphery, small pigment proliferations from the previous retinitis.

er or later the process terminates fatally with a cerebral, renal, or cardiac death.

#### PROGNOSIS

The proper evaluation of the status of the retinal arteriolar tree is the most important prognostic feature as emphasized by Wagener.<sup>2</sup> If the examination of the fundus reveals only attenuation of the arterioles, the ophthalmologist may state that the patient is as yet in the preorganic phase of her toxemia and that in all probability she will respond to conservative therapy. If, however, the attenuation is marked and particularly if the attenuation

is associated with marked accentuation of the reflex stripe, one may anticipate that the course of the disease will be relatively severer, more difficult to control, and likelier to develop complications and sequelae. This becomes even more applicable if these findings are observed early instead of late in the pregnancy. If, in addition to the above findings one encounters angiospastic features, a further element of gravity is introduced into the prognostic picture. The patient whose retinal vascular tree exhibits angiospastic changes will in all probability develop a retinitis if the disease is not promptly controlled. The objective of the treatment is to continue the pregnancy as long as possible without permitting sclerosis to develop. It is occasionally very difficult to determine at just what time the patient's condition passes over into the organic stage. In other words it is occasionally difficult to differentiate the borderline functional and organic narrowings of the vessels. If, however, retinitis develops, in the absence of definite clinical contraindications, one may say that the patient presents the ocular indications that warrant the therapeutic termination of pregnancy. The patient who develops a retinitis in the course of a toxemia of pregnancy is dangerously ill, and frequently more so than can be determined by clinical examinations and tests. The purpose of advising the termination of the pregnancy is to prevent unnecessary damage to the maternal vascular, visual, and nervous systems, and to prevent the likelihood of a fetal fatality.

In making a diagnosis of a retinitis of a toxemia of pregnancy it is imperative that one find evidence of hypertensive vascular disease; for occasionally one may encounter an anemia or leukemia complicating pregnancy in which the blood picture may be atypical.

From June, 1934, to January, 1937, 39 cases were studied in the obstetrical wards of Temple University Hospital. All

of these were diagnosed as cases of toxemia of pregnancy, or of varying degrees of preëclampsia. Sixteen of them were in the group designated as dangerously preëclamptic; 22 of them in the moderately preëclamptic group; and one in the convulsive or eclamptic group, following the classification or grouping adopted by the Obstetrical Department; namely, (1) the inherently normal, (2) the potentially abnormal, (3) the moderately preëclamptic, (4) the dangerously preëclamptic, (5) the eclamptic, or convulsive group. Patients manifesting definite cardiorenal signs and symptoms as early as the first trimester are not properly classed under the designation "toxemia of pregnancy." The Obstetrical Department places these in the category of hypertensive disease complicated by pregnancy.

All the patients in this series had some degree of elevated blood pressure. Three cases were observed for the first time in the first trimester, eight in the second trimester, and 28 were observed in the third trimester of pregnancy. All fundus examinations were made after the pupil had been dilated with 1-percent homatropine.

The fundi were reported to be normal in five cases; that is, there was no visible evidence of an attenuation of the retinal arterioles. The retinal arterioles showed the preorganic hypertensive changes in 23 cases, while actual organic changes indicative of sclerosis were observed in 11 cases. A good prognosis was given in 28 cases, a guarded prognosis in four cases and a bad prognosis in seven cases.

Of the 28 cases in which a good prognosis was given, all were delivered normally without an induced termination of the pregnancy. Untoward retinal changes were not observed in this group. In one case a mild postpartum eclampsia developed, and there was one stillbirth from separated placenta.

In the four cases in which a guarded prognosis was given, three of the patients were delivered uneventfully. One did not respond to treatment, and induction of labor was carried out successfully at eight months.

In the seven cases in which a poor prognosis was given there were no normal deliveries: In one case delivery was premature, in one therapeutic abortion was effected at three months, and in five the result was a stillbirth. All of the patients in these cases had a retinitis of a toxemia of pregnancy and all showed evidences of residual vascular damage at the time of discharge from the hospital. These cases should be given further study after more time has elapsed, and the study needs confirmation.

From this series six cases have been selected for report in detail as illustrative of the various types which one might encounter in routine observation of cases with hypertensive toxemias of pregnancy.

#### CASE REPORTS

*Case 1.* Mrs. H., aged 38 years, para four, and near full term, was admitted to the hospital for edema of the ankles of four weeks' duration and a moderate elevation in blood pressure. The physical examination was otherwise negative, and the blood pressure had become elevated from 150 systolic, 90 diastolic, to 180 systolic, 140 diastolic in two weeks. The blood sugar, Kolmer test, blood and differential counts were normal. There was a trace of albumin in the urine, and the specific gravity was 1.017. The diagnosis was moderately preëclamptic.

Ocular fundus examination revealed a generalized attenuation of all the retinal arterioles. Neither retinitis nor retinal edema was observed. The impression was hypertension of pregnancy in the pre-organic phase, and it was predicted that this patient would respond to conservative

treatment and not be left with a permanent vascular lesion. The following day the patient had a spontaneous normal delivery. On discharge, the blood pressure had receded to 120 systolic, 80 diastolic; the retinal arterioles had returned to normal.

This case is illustrative of the pre-organic hypertensive change of pregnancy in which there was a transitory functional increased vascular tonus, as demonstrated by the attenuation of the retinal arterioles and the transitory elevation of blood pressure. Patients who are delivered soon enough after the onset of the preëclampsia are not likely to suffer from the progressive vascular disease, and have a good prognosis from a vascular standpoint for the future.

*Case 2.* Mrs. A., aged 38 years, para one, and full term, was admitted because of preëclampsia and questionable labor pains. She had been vomiting during most of her pregnancy and had edema of the ankles of three weeks' duration. She had been admitted to the hospital three weeks previously for preëclampsia, at which time her blood pressure was 150 systolic, 92 diastolic. Her physical examination revealed a slight enlargement of the heart, a gravid uterus, and a blood pressure of 160 systolic, 100 diastolic. The urine was reported to contain heavy clouds of albumin; the specific gravity was 1.024; there were 5-20 granular casts and countless red blood cells. The diagnosis was dangerously preëclamptic. The retinal examination revealed generalized attenuation of the retinal arterioles with beginning sclerosis. Since she was at term, induction was advised and this was carried out.

This case illustrates a transition from the preorganic to the organic phase; that is, there was actual sclerosis in this patient's vascular system which may or may not be progressive. Albumin and casts in the urine in this type of case is considered as evidence of the hypertensive

vascular disease in the kidney and not the result of primary nephritis.

*Case 3.* Mrs. McK., aged 23 years, para one, and seven months pregnant, was admitted to the hospital because of a dangerous degree of preëclampsia. The patient stated that she felt well but that high blood pressure was known to have existed for about three months. She had previously been hospitalized elsewhere for this, and had left against her physician's advice. During the past month she had had transient attacks of blurred vision. There was edema of the ankles of one week's duration. The physical examination revealed slight periorbital edema, a systolic murmur over the mitral area, questionable enlargement of the heart to the left, and slight pitting edema of the ankles. The blood pressure was 220 systolic, 140 diastolic. The urine was found to contain heavy clouds of albumin, the specific gravity was 1.029, and there were a few granular casts. The carbon-dioxide combining capacity was 41 volumes percent. Urea nitrogen was 10 milligrams per 100 c.c. of whole blood. The patient was classed as dangerously preëclamptic.

The ocular-fundus examination revealed a generalized attenuation of the retinal arterioles with hypertensive sclerosis, grade 1+. There were some pigment scars in the retina that suggested a previous retinitis early in her pregnancy. Numerous vasospastic areas were seen in the retinal arterioles. A very poor prognosis was given.

Since the patient failed to respond to medical treatment and the severe vasospastic condition persisted in the retinal arterioles, labor was induced and three days later a two-and-a-half pound macerated fetus was delivered. The fundus report one month later was, "There is marked improvement of the retinal vascular tree. The vasospastic areas have disappeared. There is still some attenuation of the retinal arterioles with slight

residual sclerosis."

This case is illustrative of the close parallelism between the severity of the retinal vascular picture and that of generalized vascular involvement. It further illustrates the reliability of severe vasospastic changes as a criterion of the seriousness of the general picture. This is the type of retinal picture found in cases which if allowed to continue, frequently result in a permanent and progressive vascular disease that may terminate fatally at some future date with vascular failure in the heart, brain, or kidneys.

*Case 4.* Mrs. P., colored, aged 37 years, para 10, and three months pregnant, was admitted to the hospital. She had had two previous still births. For the past two weeks the patient had complained of severe headache, pains in the abdomen, and blurred vision. The physical examination revealed mild palpebral edema and edema of the ankles. There was a diffuse systolic murmur best heard over the mitral area. The blood pressure was 200 systolic, 120 diastolic. The urine contained a trace of albumin; the specific gravity was 1.026; the blood tests and differential count were normal. The Wassermann reaction was negative. The urea nitrogen was 71 mgms. per 100 c.c. of whole blood. Diagnosis: cardiorenal disease complicated by pregnancy.

The retinal examination revealed marked generalized attenuation of the retinal arterioles with retinal arteriolar sclerosis, grade 1+ of the hypertensive type. There were numerous vasospastic areas in the arterioles and a mild retinal edema.

It was inferred from these findings that the patient had had a previous hypertensive sclerosis and that superimposed on this was the acute vasospastic episode secondary to her pregnancy. Medical treatment was instituted for 10 days, and clinically the patient improved slightly. The ocular report at this time revealed

that the vasospastic features and retinal edema had disappeared. It was advised that if pregnancy were allowed to continue the patient would most probably suffer a recurrence and that the vascular status would be still further jeopardized. The urea nitrogen, however, had increased to 120 mgm. per 100 c.c. of whole blood. The following day the pregnancy was terminated. The patient was discharged one month later with a blood pressure of 160 systolic, 120 diastolic, and urea nitrogen of 98 mgm. per 100 c.c. of whole blood.

This case illustrates an acute exacerbation of a hypertension with sclerosis. The picture of the old changes (sclerosis) and the recent changes (vasospasm) were simultaneously visible in the retinal arterioles. The severe involvement of the vascular tree so early in this pregnancy makes the possibility of obtaining a viable fetus extremely unlikely and the possibility of serious complication in the mother most probable.

*Case 5.* Mrs. P., aged 40 years, para five, was admitted to the hospital when seven months pregnant. One stillbirth was in her history. There were no subjective symptoms. The patient was pale; there was moderate edema of the ankles. The systolic blood pressure was 210, diastolic 120. The cardiac consultant reported marked enlargement of the heart (15 cm.) with electrocardiographic indications of myocardial damage on a hypertensive basis. The red-blood-cell count was normal; the white-blood-cell count, 21,150. The Kolmer and Kahn tests were negative. The blood urea nitrogen was 14 mgm. per 100 c.c. of whole blood. The kidney-function test was 88 percent of normal. The urine contained heavy clouds of albumin (1 percent), with a cast count of 8 to 15 per high-power field, and a specific gravity of 1.020. The diagnosis was hypertensive cardiorenal disease.

The ocular report was: "Retinal ar-

teriolar sclerosis, hypertensive type, grade 2, with evidence of a previous retinitis of a toxemia of pregnancy. Superimposed on this is an acute vasospastic retinitis with numerous hemorrhages, exudates, and 1 diopter of edema of the discs."

Because of the very severe retinal picture, therapeutic interruption was advised. This was not done in as much as the patient improved clinically, and she was dismissed for economic reasons from the hospital to continue her pregnancy. The following week the patient was spontaneously delivered of a macerated fetus at home.

Six months later the patient was again admitted to the hospital for preëclampsia. The blood pressure was 220 systolic, 140 diastolic. The rest of the examination, including the urinalysis was essentially the same as on the previous examination.

The ocular report at this time, the consultant not knowing that the patient had been seen during her previous pregnancy was: "Retinal arteriolar sclerosis, grade 3, hypertensive type, with severe attenuation and spastic changes. There are numerous old hemorrhages and scars of a previous retinitis of pregnancy."

Since this was the picture of a very severe and progressive vascular disease, termination of pregnancy was advised. The patient was dismissed from the hospital for the same reason as before, to continue pregnancy. Three weeks later the patient was delivered, spontaneously, of a premature, stillborn fetus.

Three months later the patient returned complaining of persistent blurred vision. The entire retina was badly scarred from the previous retinitis; the vision was reduced to 6/20 in each eye; the retinal arterioles revealed sclerosis, grade 3; the blood pressure was systolic 240, diastolic 140.

This case is illustrative of the severe vascular and visual price that patients pay for persistent conservative therapy. The

retinal picture revealed the severe nature of this condition before, and out of proportion to, the clinical picture. The reliability of the retinal picture as a sign for the therapeutic interruption of pregnancy is demonstrated in this case.

*Case 6.* Mrs. D., aged 29 years, in the seventh month of her first pregnancy had a blood pressure of 110 systolic, 70 diastolic. In the eighth month her blood pressure was 130 systolic, 100 diastolic, and during this month it continued to rise until at term it had reached 192 systolic, 130 diastolic. At this time she had all the characteristic signs of a dangerous degree of preëclampsia, including almost complete blindness, due to vasospasm of the retinal arterioles. She had a normal spontaneous delivery. The systolic pressure was reduced to 138, but the diastolic remained at 100 mm. Hg. Eight months later, when three months pregnant, it was necessary to induce a therapeutic abortion, due to severe symptoms of toxemia of pregnancy. Five years later the next available blood pressure was 220 systolic, 160 diastolic. At this time the fundus examination showed retinal arterial sclerosis, grade 1, hypertensive type, with old scars of a previous retinitis of a toxemia of pregnancy. Eighteen months later the patient was admitted to the hospital. She was acutely ill with renal failure. Urea nitrogen was 50 mgm. per 100 c.c. of whole blood. The carbon-dioxide combining power was 47 volumes percent. The urine showed clouds of albumin and casts and the blood pressure was 230 systolic, 145 diastolic.

The fundus examination showed that the retinal arteriolar sclerosis had progressed to a grade 2. In addition, there were various vasospastic areas as well as numerous cotton-wool exudates and hemorrhages, with 1 diopter of edema of the discs. The impression was that the condition represented the terminal retin-

itis of a previous toxemia of pregnancy. The patient became irrational and died the following day.

This case illustrates the typical progressive course of an excessively damaged vascular tree resulting from prolonged conservative therapy at the time of the original toxemia of the first pregnancy. Had this patient been delivered in the preorganic phase, her vascular tree would have most probably returned to normal. However, the duration and intensity of this original toxemia were sufficient to produce this progressive vascular lesion with its subsequent fatal termination.

#### SUMMARY

The first visible physical sign of early preëclampsia is attenuation of the nasal retinal arterioles. This is usually concurrent with slight elevation of the diastolic blood pressure. The great majority of these cases do not become sufficiently severe to progress further than this stage; they will usually respond to medical treatment as suggested by Arnold.<sup>8</sup> If they do, the patient will be left without a demonstrable vascular lesion. In a small percentage of the cases, however, the disease is much more fulminating and treatment must be heroic. The earliest and most reliable signs of the severe course of these conditions is the appearance of the retinal arterioles. The severe changes in the retinal arterioles usually precede the clinical criterion of severity in these conditions. The appearance of hemorrhages and exudates associated with hypertensive vascular change in the retinal arterioles is a reliable sign for the therapeutic termination of pregnancy. Proper interpretation of these changes will materially reduce the vascular damage done to the mother, and reduce the incidence of fetal and maternal mortality.

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### LEUKEMIC INFILTRATION OF THE RETINA AND CHOROID IN AN INFANT TREATED BY X RAY\*

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This report concerns a 15-months-old infant known to have been leukemic since the third month of life. The child had been blind for two weeks from massive infiltration of the posterior segments of the eyes when treatment by roentgen radiations was instituted. A few weeks later the retinal infiltrations had disappeared and some degree of sight was present.

Myelogenous leukemia in very young infants seems to be rather rare. Kornman<sup>1</sup> in 1932 stated that only six cases including her own had been reported to that time. Dr. J. V. Cook<sup>2</sup> reported that four cases of acute leukemia are on record at Saint Louis Children's Hospital but that no other case has been described in which an infant presented the features of chronic myelogenous leukemia noted in the one under consideration.

The clinical signs and symptoms described in all cases listed by Kornman are as follows:

(a) Hemorrhages in the skin and all organs and parts of the body; (b) enlargement of the liver and spleen; (c) satisfactory growth and development for several weeks followed by a period of rapid decline in which there is fever, a decrease in red blood cells, and an increase in white cells; (d) an infiltration of all organs with myeloblasts.

The diagnosis between lymphatic and acute myelogenous leukemia is difficult, being based on the large percentage of myeloblasts in the blood which parallels the increasing percentage of white cells as the anemia increases.

The fundus changes seen in leukemia are varied from a simple venous stasis to a picture of severest retinitis. The typical findings are scattered retinitic lesions with hemorrhagic borders, and a yellowish color of the blood vessels or even of the entire fundus reflex. The discs present all grades of changes from slightly blurred margins to high degrees of choked disc.

The swollen discs and retinal hemorrhages and edema resemble those associ-

\*From the Department of Ophthalmology, Washington University School of Medicine. Read before the Saint Louis Ophthalmic Society, April 12, 1937.

ated with increased intracranial pressure. These changes are perhaps due to pressure from meningeal infiltrations. The stasis of the retinal vessels and edema of the nerve may also be due to meningeal leukemic infiltrations leading to checking of the venous return without gross intracranial changes.

Roentgen radiation is an empirical treatment for the so-called malignant lymphomas but is nevertheless the therapy of choice. O'Brien<sup>8</sup> states that irradiation is the one measure that has any appreciable effect on the size of the spleen and adenopathy elsewhere. He quotes Isaacs<sup>4</sup> as stating definitely that the action of radiation in leukemias is one of stimulation of the blood cells to divide if in the blast stage or to mature in a normal manner if of adult character.

Local irradiation of the eyes was recommended in the following case because of the well-known effectiveness in reducing leukemic infiltrations in other parts, notably in the spleen and lymph nodes.

#### THE CASE REPORT

Baby P. R., aged 15 months, was first seen December 22, 1936. The eyes had been red and tearing for six weeks and apparently blind for one week. A diagnosis of detachment of the retina had been made elsewhere.

At three months of age enlargement of the spleen had been noted and blood examination revealed a white count of 200,000, hemoglobin 45 percent, red blood count 2,500,000 with many nucleated reds. There were numerous purpuric spots.

The child at that time was acutely ill with a temperature of 102°F.

Blood transfusions and generalized X-ray therapy had been instituted, with marked improvement in the general condition and reduction in the blood count. Growth and development had progressed

normally during the next 10 months.

The admission note at Saint Louis Children's Hospital, on December 22, 1936, stated:

The patient is chronically ill, irritable, pale, well developed and nourished. The eyes are prominent; the temperature is normal; there are many purpuric spots on all parts of body. The ears are normal; there are a moderately acute nasopharyngitis and enlarged tonsils. The cervical, inguinal, and axillary nodes are enlarged. The lungs are clear; the heart negative. The liver and spleen are markedly enlarged, three fingers below the costal margin. The urine is normal.

Blood: hemoglobin, 75 percent; red cells, 4 million; white cells, 19,200; decreased platelets.

Differential count of 100 cells: eosinophils, 2; segmented cells, 44; myelocytes, 9; lymphocytes, 22; juveniles, 9; monocytes, 1; rod shaped, 13; nucleated reds, few. Peroxidase stain showed 91 percent granular cells; 9 percent nongranular.

Examination of eyes: the conjunctiva was moderately injected; there was a mucopurulent discharge, with moderate lacrimation. The corneae were clear; the anterior chambers very shallow. The pupil of the right eye was larger than that of the left, and showed no reaction to light. The vision was apparently nil. There was no lid reflex nor other response to bright light. The intraocular tension was 16 mm. Hg (Schiötz).

Fundus. Right eye: the anterior media were clear, but fundus details were obscured by posterior haze. In the temporal aspect a large elevated gray mass as of detached retina was visible. Left eye: the posterior media were hazy revealing only a gray elevated mass up and temporally.

Transillumination: no light was transmitted to either pupil.

Ophthalmoscopic diagnosis: massive exudate or infiltrate behind each retina.

Four local treatments with X rays were given, as follows:

Date	Dose	Site
December 22	60 R.	lateral aspect, left eye.
December 29	100 R.	lateral aspect, right eye.
December 30	100 R.	anterior aspect, left eye.
December 31	100 R.	anterior aspect, right eye.

Ten days after the first treatment some response to light stimuli could be elicited and the media had cleared to reveal an elevated gray retina in the right eye measuring +12.0 diopters with the ophthalmoscope. In the left eye, the elevation was +4.0 diopters.

Four weeks later there was definite response to light thrown into the left eye only. A fundus examination revealed clear media, and elevation of +3.0 diopters in the retina of the right eye, but no elevation in the left. The discs were pale and blurred; the vessels normal in color and contour. There were some pigment de-

posits as of old retinal hemorrhages. The inferior aspect of the right fundus was gray in color.

The general condition of the patient was good during the first four weeks of hospital stay, but with the onset of an acute upper respiratory infection, there was bleeding from the mucous membranes of the nose and mouth and a marked decline in strength. Blood transfusions and other measures checked the hemorrhages, but the patient was sent home after the sixth week with little prospect of further recovery.

March 6, 1937, word was received that the patient had died, but the family had noted some ability to see during the latter weeks of life.

*Comment:* In the blood picture and the year's duration of life after the known presence of the disease, this case more closely resembles the chronic myelogenous leukemia seen in adults than the acute leukemia of infants.

There was unmistakable improvement in the posterior-segment infiltration of the eyes following roentgen therapy.

*Carleton Building.*

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# EXPERIMENTAL STUDIES OF THE EFFECT ON RETINAL BLOOD PRESSURE AND INTRAOCULAR TENSION OF PRESSURE APPLIED TO THE EYEBALL

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The object of this investigation was to determine: A (1) The tension in the normal and glaucomatous human eyeball in a consecutive series of private patients of varying ages, in the prone position, after a 1-ounce lead weight had rested on the eyeball for one-half minute and three minutes, and 15 seconds and two minutes after pressure had been relieved; also after applying a pressure of 50 grams with a Bailliant ophthalmodynamometer to the eyeball midway between the insertion of the external-rectus muscle and the limbus, for one-half minute and two minutes, and 15 seconds and two minutes after relieving the pressure.

(2) The correlation between the retinal-blood-pressure findings before and after pressure on the eyeball in normal and glaucomatous eyes, and the filtration findings.

B (1) The effect of mydriatics on the intraocular tension after pressure had been applied externally to the eyeball.

(2) The relationship between the depth of the anterior chamber and the intraocular tension in experiments under B(1).

## A. METHOD

Series A consisted of 54 patients and 104 eyes, four of the patients being monocular. Of this number, 83 eyes were normal and 21 eyes were definitely glaucomatous. The examinations, with few exceptions, were made following a complete examination of the refraction of the eye, in which the pupils were dilated with six drops of a 1.6-percent solution of homatropine hydrobromide, one drop being instilled into the conjunctival cul-

de-sac of each eye at 10-minute intervals for six instillations, in patients up to 40 years of age; in patients of 40 years or older, from one to three drops of a 0.5-percent solution of homatropine hydrobromide were used to dilate the pupils.

The eyes were all anesthetized with a 2-percent solution of butyn, one drop being put into each eye every three minutes for three instillations.

The diastolic retinal blood pressure was then taken in the dark room according to the method of Professor Bailliant,<sup>1</sup> using the plunger type of Bailliant ophthalmodynamometer with the patient in the sitting position. When the first arterial pulsation was difficult to see, three readings were made and the average was recorded.

The intraocular tension in each eye was then taken with the patient in a quiet room, in the dorsal decubitus, on an operating table. Uniform indirect illumination of four foot-candles was used. All tonometric measurements were made with the Gradle-Schiötz tonometer, either by a trained nurse or by the ophthalmologist. Three different weights were applied, and the average recorded.

The following technique was used: The intraocular tension in each eye was taken and recorded; pressure was then applied to each eyeball through the closed eyelids for one-half minute, by placing a one-ounce lead weight on the eyeballs. At the end of the half minute, the intraocular tension was taken immediately after the removal of the weight, and again after an interval of two minutes from the time the weights were removed. The same ex-

periment was repeated, leaving the weights on for three minutes.

In the next experiment, a pressure of 50 grams was applied directly to the anesthetized eyeball, with the Bailliart ophthalmodynamometer, at a point midway between the insertion of the external rectus muscle and the limbus, care being exercised to hold the instrument perpendicularly to the tangent of the globe. Pressure was applied for one-half minute and the intraocular tension taken at the end of that time. The tension was taken again at the end of a two-minute period from the time the pressure was released. The experiment was repeated, this time applying the 50-gram pressure for two minutes. The patient was then taken to the dark room where the retinal diastolic blood pressure was determined.

In some cases it was impossible to obtain an accurate estimation of the retinal blood pressure, either because of the extremely small size of the pupils or because of inability to see the fundus, owing to cataractous changes in the lens or other pathological conditions that obscured the details.

The relatively small number of patients examined in this series is accounted for by the length of time required to conduct the experiments, which, added to the time required for a complete refraction, was exhausting to the patients; in many instances objections were made by them.

### RESULTS

Of the 54 patients, 23 were males and 31 were females.

The ages ranged from 13 to 76 years: 31 patients were under 40 years of age; 23 were 40 years old or older.

It is evident from these tabulations that the retinal diastolic blood pressure and the intraocular tension decrease in direct proportion to the amount of pressure used and the length of time it is applied. It has

long been known that massage of the cornea causes a decrease in intraocular pressure.<sup>2,3</sup> This fact would seem to be substantiated by these experiments. The direct relationship between the retinal diastolic blood pressure and intraocular pressure substantiates the fact brought out by Bailliart,<sup>1</sup> in a series of 19 cases in which he found that the retinal diastolic blood pressure was higher in eyes with greater intraocular tension, and, conversely, when the intraocular tension was lowered by a miotic or by surgical measures, the retinal blood pressure fell. Bailliart gives 30 to 35 mm. Hg as the normal limits for the retinal diastolic pressure, and says that change of position affects the retinal blood pressure but little. Berens<sup>4</sup> reported 11 cases in which he found the normal retinal diastolic blood pressure to be 32.3 mm. Hg in the right eye and 32.2 mm. Hg in the left eye. He found further in the examination of eight patients, by the Bailliart method, that the diastolic pressure increased from 35 mm. Hg in the standing position to 41 mm. Hg in the prone position. In my series of 83 normal eyes, the retinal diastolic blood pressure (right eye 31.1 mm. Hg; left eye 30.7 mm. Hg) compares favorably with the first series of 11 cases reported by Berens.

In 14 glaucomatous eyes, it was impossible to determine accurately the retinal diastolic blood pressure because of cloudiness of the media. It is of interest to note that the retinal blood pressure in the glaucomatous eyes did not return to the initial reading, but in the normal eyes the retinal blood pressure was practically the same before and after the pressure was applied. This discrepancy is explained probably by the decrease in rate of filtration at the angle of the anterior chamber in glaucomatous eyes, and to the fact that the tissues are less distensible. This is shown by a failure of the

intraocular tension to return to the initial reading in the same length of time, again showing that the pressure in the retinal same, the retinal-blood-pressure measurements in the two eyes were likewise practically the same; conversely, when the

TABLE 1  
RETINAL DIASTOLIC BLOOD PRESSURE

		Average mm. Hg	Minimum mm. Hg	Maximum mm. Hg
83 Normal eyes	O.D.	31.1	22.0	61.0
	O.S.	30.7	22.0	58.0
7 Glaucomatous eyes*	O.D.	77.5	59.0	90.0
	O.S.	61.0	38.0	85.0

\* In 14 eyes the retinal diastolic blood pressure could not be obtained.

TABLE 2  
INTRAOCULAR TENSION AND BLOOD PRESSURE BEFORE AND AFTER APPLICATION OF PRESSURE

			TENSION			
<i>Before</i>			Average mm. Hg	Minimum mm. Hg	Maximum mm. Hg	
83 Normal eyes	O.D.		17.2	11.0	25.0	
	O.S.		16.4	9.0	24.0	
21 Glaucomatous eyes	O.D.		44.7	24.0	71.0	
	O.S.		28.5	17.0	59.0	
<i>After</i>			Normal eyes after wt. removed		Glaucomatous eyes after wt. removed	
Weight	Time applied		15 sec. mm. Hg	2 min. mm. Hg	15 sec. mm. Hg	2 min. mm. Hg
1 oz.	$\frac{1}{4}$ min.	O.D.	16.0	17.0	42.0	44.0
		O.S.	15.0	16.0	23.0	25.0
1 oz.	3 min.	O.D.	15.0	16.0	40.0	42.0
		O.S.	13.0	15.0	21.0	23.0
50 gm. with ophthalmodynam.	$\frac{1}{4}$ min.	O.D.	15.0	16.0	42.0	41.0
		O.S.	15.0	15.0	30.0	25.0
50 gm. with ophthalmodynam.	2 min.	O.D.	12.0	15.0	36.0	38.0
		O.S.	11.0	13.0	20.0	20.0

RETINAL DIASTOLIC PRESSURE AFTER COMPLETED EXPERIMENT

		Average mm. Hg	Minimum mm. Hg	Maximum mm. Hg
83 Normal eyes	O.D.	31.0	21.0	50.0
	O.S.	31.0	21.0	58.0
5 Glaucomatous eyes	O.S.	72.0	58.0	75.0
	O.D.	40.0	55.0	55.0

arteries is dependent on the intraocular tension. In this connection, it is of interest to note that in almost every case in which the pressure in both eyes was about the

intraocular tension in one eye was higher than in the other, the retinal blood pressure was also found to be elevated in the eye with the greater intraocular tension.

I am aware of the inaccuracies of the figures produced by resting a lead weight of one ounce on the eyeball through the closed eyelids, as compared with the more accurate method of applying a definite pressure to a definite point on each eyeball, which is obvious from the table. However, the results obtained by pressure applied to the eyeballs by means of the weights confirm those obtained by the more accurate method of applying a definite pressure to a definite point on the eyeball with the ophthalmodynamometer.

#### CONCLUSIONS

1. After a complete refraction, 54 patients from 13 to 76 years of age, nine of whom had glaucoma, had the retinal diastolic blood pressure and intraocular tension measured both before and after the application to the eyeball of pressures of definite amounts for definite periods of time.

2. The average retinal diastolic blood pressure for the normal eyes was: O.D. 31.1 mm. Hg; O.S. 30.7 mm. Hg, and for the glaucomatous eyes: O.D. 77.5 mm. Hg; O.S. 61 mm. Hg.

3. The average intraocular tension for the normal eyes was O.D. 17.2 mm. Hg; O.S. 16.4 mm. Hg; and for the glaucomatous eyes: O.D. 44.7 mm. Hg; O.S. 28.5 mm. Hg.

4. In the majority of cases, the retinal diastolic blood pressure is affected in direct proportion to the intraocular tension.

5. The intraocular tension in normal eyes is reduced in direct proportion to the amount of pressure exerted on the eyeball and by the length of time it is applied.

6. The intraocular tension in glaucomatous eyes is reduced by pressure applied externally to the eyeball in direct proportion to the rapidity with which filtration occurs at the angle of the anterior chamber

and through other channels of outlet.

7. Determination of the retinal diastolic blood pressure by a trained observer is a valuable adjunct in the diagnosis of incipient glaucoma, other factors being equal.

#### B. METHOD

Series B consisted of 135 consecutive private patients and 266 eyes, as four of the patients were monocular. No age limit was made except in the case of young children and extremely nervous individuals who were excluded for obvious reasons. No patients with manifest diseases of the eyes were included in the series.

In each case a complete history of the patient was taken, the manifest refraction performed, after which the depth of the anterior chamber of each eye was measured by means of the micrometer focusing device of the corneal microscope and slitlamp.

The eyes were then anesthetized with a 2-percent solution of butyn, one drop being instilled every three minutes for three instillations.

The intraocular tension in each eye was then taken, with the patient in the dorsal decubitus, flat on his back, on an operating table in a quiet room. Uniform indirect illumination of four foot-candles was used. All tonometric measurements were made with the Gradle-Schiötz tonometer (either by a trained nurse, or by the ophthalmologist), using three different weights, and the average of the three readings was recorded for each eye.

A pressure of 50 grams was then applied directly to the anesthetized eyeball, with the Bailliarth ophthalmodynamometer, at a point midway between the insertion of the external-rectus muscle and the limbus. Pressure was applied for two minutes and the intraocular tension computed at the end of this time. The same

experiment was repeated on the left eye.

The accommodation was then suspended with six drops of a 1.6-percent solution of homatropine hydrobromide, one drop being instilled in each eye at 10-minute intervals for six instillations, in patients up to 40 years of age; in patients of 40 years or older, from one to three drops of 0.5-percent solution of homatropine hydrobromide were used.

The retinoscopy, determination of

The age of the patients ranged from 17 to 80 years, distributed as follows:

No. of patients	Age group years	Monocular
5	17 to 20	
34	21 to 30	
16	31 to 40	1
28	41 to 50	
24	51 to 60	2
18	61 to 70	1
10	71 to 80	

Total 135 patients—266 eyes

TABLE 3  
INTRAOCULAR TENSION AND THE EFFECT OF PRESSURE APPLIED TO THE EYEBALL BEFORE AND AFTER INSTILLATION OF MYDRIATIC

	Average—266 normal eyes		17-20 years		21-30 years		31-40 years		41-50 years		51-60 years		61-70 years		71-80 years	
	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.
Intraocular Tension:																
Average (mm.Hg)	20	18	20	18.5	21	19	21	17.5	21	21	21	18	19	16	21	19
Minimum (mm.Hg)	10	10	13	13	13	11	13	10	10	10	13	11	11	13	10	10
Maximum (mm.Hg)	43	38	24	24	24	24	28	28	28	28	33	28	28	24	43	48
Intraocular Tension 15 seconds after a pressure of 50 grams had been applied for 2 minutes:																
Average (mm.Hg)	15	12	14	12	15	13	15	12	14	13	15	13	12	11	16	13
Minimum (mm.Hg)	8	8	10	10	10	9	9	9	10	9	11	8	9	9	8	8
Maximum (mm.Hg)	24	24	20	14	20	20	24	20	20	20	24	24	20	17	24	19
Intraocular Tension after instillation of mydriatic:																
Average (mm.Hg)	20	18	20	18	19	17	18.5	16	21	19	21	19	19	16	23	20
Minimum (mm.Hg)	10	9	13	12	13	12	11	10	13	13	13	13	13	13	10	9
Maximum (mm.Hg)	38	33	24	24	24	24	24	24	38	28	38	33	28	24	38	33
Intraocular Tension 15 seconds after a pressure of 50 grams had been applied for 2 minutes:																
Average (mm.Hg)	14	13	15	13	14	12	14	11	14	14	16	14	13	11	15	16
Minimum (mm.Hg)	9	8	13	10	9	10	8	8	10	9	11	10	8	8	9	8
Maximum (mm.Hg)	28	24	17	17	20	17	20	17	28	20	24	20	17	13	25	24

vision with retinoscopic findings, and ophthalmoscopic examinations were then made, after which the eyes were again anesthetized and the tonometric measurements, both before and after applying a pressure of 50 grams with the ophthalmodynamometer, were recorded according to the method already described.

After completion of the experiments, the effect of the mydriatic was counteracted by the instillation in each eye of a 1-percent solution of eserine or a 1-percent solution of pilocarpine, depending upon the strength of the mydriatic used.

Of the 135 patients, 48 were males and 87 were females. Four were monocular.

The depth of the anterior chamber in these 266 normal eyes was found to range as follows:

	Average mm.	Minimum mm.	Maximum mm.
O.D.	2.73	1.21	3.85
O.S.	2.73	1.98	3.85

Little comment is necessary as the various tables are self-explanatory. Gradle<sup>5</sup> has shown that the intraocular tension is lowered in the group containing the youngest subjects and increases steadily to a maximum in the 61-70 decade, and the essayist's figures confirm this result.

TABLE 4  
CLASSIFICATION BY DECADES

		17-20	21-30	31-40	41-50	51-60	61-70	71-80
Number of eyes		10	68	31	56	47	34	20
Average pressure in mm. Hg	O.D.	20	21	21	21	21	19	21
	O.S.	18.5	19	17	21	18	16	19
No change in tension after use of mydriatic in mm.Hg	O.D.	1	15	5	14	11	9	3
	O.S.	3	15	8	13	10	10	3
Tension decreased more than 3 mm. after use of mydriatic in mm.Hg	O.D.	2	15	8	6	4	4	2
	O.S.	1	14	5	10	4	3	2
Average depth of anterior chamber in millimeters	O.D.	3.15	2.82	2.75	2.76	2.60	2.56	2.45
	O.S.	2.95	2.81	2.79	2.76	2.63	2.54	2.58

#### SUMMARY AND CONCLUSIONS

1. One hundred thirty-five consecutive patients, varying in age from 17 to 80 years, were measured tonometrically, both before and after dilatation of the pupils for refraction.

2. The average initial intraocular tension of the 266 eyes was 19 mm. Hg. The tension increased gradually according to age, being lowest in the 17-to-20-year group, and highest in the 71-to-80-year decade.

3. Intraocular tension is decreased by the application to the eyeball of a pressure of 50 grams for two minutes with the ophthalmodynamometer.

4. The action of the mydriatic had little or no effect on the relative reduction in intraocular tension after applying a pres-

sure to the eyeball of 50 grams for two minutes, with the ophthalmodynamometer.

5. The average depth of the anterior chamber in 266 eyes was 2.73 mm.

6. The depth of the anterior chamber is greatest in the 17-to-20-year group, and decreases slightly in each succeeding decade to the 71-to-80-year group in which the depth of the anterior chamber is the least.

7. In individuals of 30 years or older, it is important that the intraocular tension be taken and recorded both before and after the instillation of a mydriatic or cycloplegic. By so doing many cases of preglaucomatous conditions will be detected which otherwise would remain undiscovered.

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## KERATOCONUS

### A REPORT OF FIVE CASES

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Keratoconus is defined by Collins and Mayou<sup>1</sup> as "a failure in the postnatal toughening of the corneal tissue." Again we find: "In the condition termed keratoconus there is a bulging of the central part of the cornea occurring apart from any inflammation or increased intraocular pressure. In some cases the ectasia is confined to the central zone, a shallow furrow being present at the junction of the cone with the more normal peripheral portion of the cornea. In others there is a hyperbolic curvature of the cornea as a whole with a gradual diminution in the thickness of the cornea from its periphery towards the center."<sup>2</sup>

A brief review of the embryology and histology of the human cornea is essential to an understanding of the pathology of keratoconus. "The tissues involved in the development of the human eye can be broadly classified under the headings: (a) surface ectoderm; (b) neuro-ectoderm; (c) associated mesoderm. From that portion of the surface which is in contact with the optic vesicle, with a small surrounding area, will develop the lens and the epithelial covering of the cornea, conjunctiva, and the lids, together with the epithelial structures associated with the lids; namely, the hairs and the glands."<sup>3</sup> "The paraxial mesoderm gives rise to the substantia propria of the cornea and the endothelium of its posterior surface."<sup>4</sup> The differentiation of the substantia propria of the cornea and the mesodermal stroma of the iris occurs at the 18 to 20-mm. stage."<sup>5</sup> According to Benjamin Rones<sup>6</sup> of Baltimore, the method of this ingrowth is described differently, though the tissues forming the cornea are the same.

In about the tenth week, or the 49-mm. stage, the rudimentary cornea is forming together with the appearance of Descemet's membrane. At seven months the cornea resembles that of the adult in its histology. At about the fourth month the corneoscleral junction begins to be apparent and the corneal curvature differs from that of the sclera.

Salzmann<sup>7</sup> states: "The adult cornea has the form of a strongly curved meniscus to which in and of itself one must ascribe a weak refracting power because it is thinner in the center than it is at the edge, 1 mm. or slightly more. The radius of curvature of the anterior surface is 7.84 mm. on the average. This radius of curvature holds true, however, for the central third of the cornea, the so-called optical zone, which is curved almost exactly like a sphere; the peripheral parts are notably flattened and more so upon the nasal than upon the temporal side. . . . A plane going through the outer visible border of the cornea is called the base of the cornea, and the distance between it and the center of the cornea the height of the cornea; this amounts to about 2.6 mm. It increases with the curvature of the cornea and the size of the cornea, for a larger segment of a given sphere is higher than a smaller one. . . ."<sup>8</sup> In the cornea proper one distinguishes five layers: (a) epithelium; (b) Bowman's membrane; (c) stroma corneae; (d) Descemet's membrane; (e) endothelium."<sup>9</sup>

The corneal epithelium has a uniform thickness over the greater part of the cornea, varying from 37 to 58  $\mu$  in thickness. The anterior and posterior surfaces are parallel, and the arrangement is that of a stratified pavement

epithelium five or six layers in thickness.

Bowman's membrane is next. This is a structureless membrane, 10 to 16  $\mu$  in thickness. Its curvature on the anterior surface is the same as that of the corneal epithelium. This membrane is perforated by nerves at points called pores.

The corneal stroma forms the greatest bulk of the cornea or about 90 percent of the entire thickness. It is made up of lamellae that are parallel to the surface. These lamellae interlace with each other extensively, and branches or fibrillae from one join with those from another. The corneal stroma also contains numerous elastic fibers and nerves. The elastic fibers generally course parallel with the structure of the lamellae. The nerves consist of medullated and non-medullated fibers. Two plexuses are formed, one of coarse fibers deep in the structure, and a second one of fine fibers lying superficially in the corneal stroma. The perforating branches come from these plexuses.

Descemet's membrane is a typical glass membrane. It is structureless and highly refractile, very firm and elastic. Its two surfaces are distinct and parallel. Unlike Bowman's membrane, which does not regenerate following injury, Descemet's membrane does regenerate in time.

The endothelium is a single layer of cells, 5  $\mu$  in height, which lies on the posterior surface of Descemet's membrane.

"The average diameter of the normal cornea is 11.67 mm., and it reaches its full size as early as the end of the second year. From the sixth month of foetal life, when the anterior chamber is first formed, up to the end of the second year its growth is rapid—during this time it doubles in size."<sup>10</sup> The cornea has not at this time completed its full development. It gradually grows tougher and becomes less expansile. Its radius of curvature in-

creases slowly until the age of puberty.

Conical cornea is an unusual condition in which there is a loss of the normal curves of the cornea with the substitution of a protrusion at its center. This may be more or less marked and is usually in the form of a cone, although at times it may be a hyperbolic curve. The center of this cone is usually somewhat below the center of the cornea.

According to the American Encyclopedia of Ophthalmology, volume 4, p. 2979, Desmours ("Traité des maladies des yeux," Paris, 1818) observed the condition in 1747, and it was described by Scarpa ("Traité des maladies des yeux" Paris, 1802, volume 2, page 179).

Swanzy<sup>11</sup> made this statement: "The change is due to a gradual and slowly advancing atrophic process in the cornea at or near its center, in consequence of which the normal intraocular tension acts on it to distort it into conical form."

Salzmann<sup>12</sup> presented a careful histological study of the eye affected by keratoconus. The examination showed the following conditions (a) A thinning of Bowman's membrane with many gaps in its continuity. (b) A filling of the gaps in Bowman's membrane with an elastoid connective tissue similar to that found in pinguecula. (c) At the apex of the cone a tendency to a splitting of the deeper layers of the cornea. (This may be due to an artefact.) By this process lacunae longer than those in normal corneal stroma are formed. (d) A large gap in Descemet's membrane at the region of the greatest ectasia. Descemet's membrane elevated and curled at the edges. (e) The endothelium grown round on to the anterior surface of Descemet's membrane and the cells showing granular and other changes.

Salzmann recognized two types of keratoconus: (a) that in which the ectasia is confined to the optical zone, and

(b) that in which there is a gradual thinning of the cornea from the periphery to the center, forming a hyperbolic type of curve.

The etiology of keratoconus is unknown. It is a rare affection, but it may occur in several members of the same family, either in the same or in succeeding generations. The most probable cause of the ectasia is some aberration in the functioning of the endocrine glands. Von Hippel<sup>13</sup> reports that by means of Abderhalden's reaction he found evidence of abnormality in the glands of internal secretion in cases of keratoconus.

Again, Siegre<sup>14</sup> made the observation, before 1910, that patients with conical cornea are often thin, nervous, pale, with dry skin and a tendency to loss of hair, weakness of memory, and showing characteristic blood changes—an increase in lymphocytes and a lessened coagulation period.

Arnold Knapp<sup>15</sup> has stated that: "The question of keratoconus may be simplified by assuming the truth of the following statements: (a) Keratoconus first attracts attention in adolescence, though it undoubtedly starts much earlier. (b) Anatomical examination has demonstrated nothing but a stretching of corneal tissue. (c) The intraocular tension is normal or subnormal. (d) The keratoconus often occurs in poorly nourished anemic patients, usually females, who present various signs connected with hypothyroidism, such as nervous disturbances, a dry skin, increased sweating, fragile nails, loss of hair, hypertrichosis, pronounced lymphocytosis, and increased coagulability of the blood."

In determining the cause of any abnormal condition the embryology, anatomy, histology, and pathology of the disease must be understood. The next step is to determine what factors are responsible for the normal growth of the embry-

onic tissues that form the diseased organ in question. It is only through this method that one can endeavor clearly to formulate the causative factor or factors which establish a disease as endocrine in origin.

R. C. Moehling<sup>16</sup> in discussing the embryohormonic relation of the pituitary gland to mesodermal tissue stated as follows: "The pituitary gland has a selective action on mesodermal tissues. This fundamental fact becomes of greatest importance when disease involving mesodermal tissues is present. Constitution inheritance is exerted through the medium of the endocrine glands on certain tissues and in this article it will be shown that the pituitary gland influences the development and nutrition of the mesodermal tissue.

"From the mesoderm are derived the following tissues:

#### Mesenchyme

- a. Connective and supporting tissue
- b. Cutis or corium, including hair and papillae
- c. Cartilage—bone
- d. Dentine and cementine of the teeth
- e. Pigment cells
- f. Lymph glands
- g. Spleen
- h. Blood
- i. Blood vessels
- j. Fat cells
- k. Smooth muscle
- l. Renal cells
- m. The joint cavities, the bursae, subarachnoid and subdural spaces and their lining
- n. Nerve corpuscles
- o. Adrenal cortex
- p. Sex glands
- q. Striated muscles (including cardiac)
- r. Pleura, pericardium and peritonium."

The cornea falls in group a, comprising connective and supporting tissue.

Thus, altered action of the pituitary gland will affect any or all of these structures to a greater or less degree. The patients described in the literature as suffering from keratoconus and endocrine imbalance are of the asthenic type of lessened pituitary activity.

#### CASE REPORTS

The glucose tolerance\* test shows a typical and unusual curve of the urinary excretion of sugar in four active cases of keratoconus. No renal glycosuria was present in one case of quiescent keratoconus. The patients in cases 4 and 5 were placed on antuitrin:

½ c.c. 3 times a week for 2 weeks

1 c.c. 3 times a week for 8 weeks

1 c.c. twice a week for 4 weeks

1 c.c. once a week for 8 weeks

Case 5 has remained stationary since June, 1936. In another case (not re-

ported) the patient had, in addition, thyroxin, 1 drop in each eye q.i.d. for six weeks. The eyes have remained stationary since May 11, 1936.

*Case 1.* L. W., a white male, aged 28 years complained on December 24, 1931, of inability to read. At least six pairs of glasses had been prescribed in the past year and the axis of these lenses had been frequently changed. The vision of the right eye was very poor and when it was improved the vision of the left eye was confused. Headaches were experienced frequently and the eyes tired easily.

The salient points of the past history and physical examination were:

Family history: Essentially normal except for tuberculosis in some members.

Personal history: A twin, weakling; the parents were told he would not live.

Physical examination: Height 5 ft. 10½ in.; weight 145 lbs. (should be 160 lbs.) with general development fair, and a dry, sallow skin. Ears: Right, normal. Left, radical mastoid scar with pulsating discharge. Sella turcica: X-ray examination showed it normal in appearance. Basal metabolism: plus 4 and plus 2. Blood, urine, and all other laboratory tests were within the normal limits.

Previous ocular examination: On October 19, 1923, vision in the R.E. was 20/50. After refraction (cycloplegic) with a +37 D. sph. = +0.25 D. cyl. ax. 115° vision was 20/40+3. Vision in the L.E. was 20/40-2. After refraction with a +0.50 D. sph., no cyl., vision was 20/25.

Postcycloplegic examination: R.E. V. 20/15, L.E. 20/15. The patient returned in January, 1929 (aged 24). There was a sty at the inner corner of the right eye. Vision: R.E. 20/200, L.E. 20/50.

He returned again in February, 1930 (aged 25). Vision in the right eye was poor, and when improved caused confusion in the vision of the left eye. A stronger myopic sphere was prescribed with

\* The glucose-tolerance test used is a routine test. It consists of giving 100 grams of glucose in 200 c.c. of water on an empty stomach, and then determining the elevation of the blood sugar.

Formerly the test was used to determine whether a person was diabetic or not; at present it has been used much less extensively for this purpose. It is of value in determining the renal threshold in those cases in which the alimentary absorption is rapid enough to elevate the blood sugar above the threshold. The intravenous method would be still more accurate than the oral. It is somewhat more complicated in administration.

The charts included indicate the accepted normal blood and urinary sugar levels in the shaded portion.

Some of the factors that vary the glucose-tolerance test are: (1) Diet preceding the test. High-carbohydrate diet gives a low blood-sugar curve and vice versa; (2) rate of absorption from the alimentary canal; (3) liver function; (4) possible pancreatic activity.

It is impossible to differentiate these factors or even to evaluate them at present. It is because of these unknown quantities in the test that its value is principally in the determination of the renal threshold or that level of the blood sugar that permits sugar to be excreted by the kidneys.

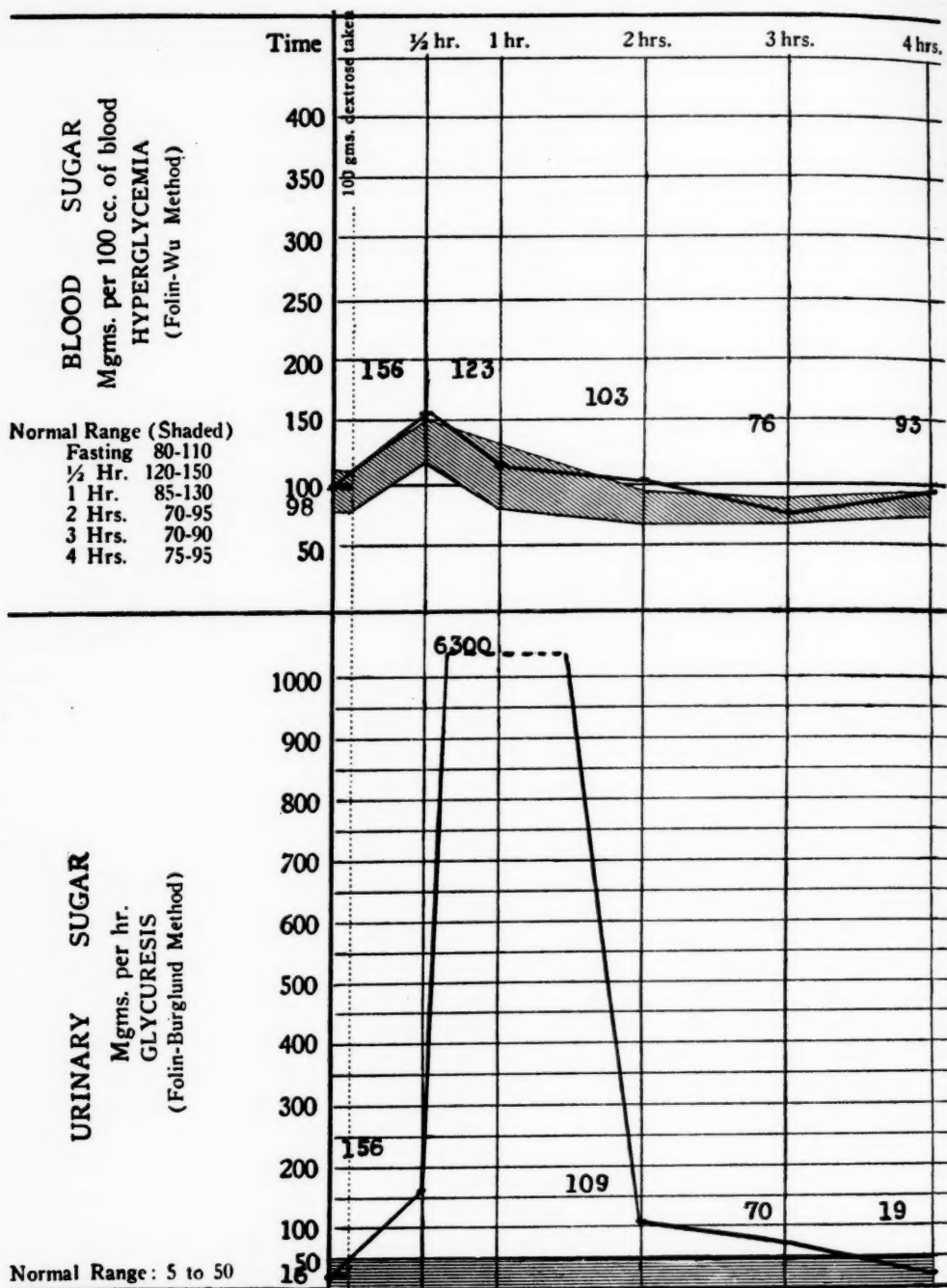


Chart 1 (Dodge). Glucose-tolerance test in case 1 (L. W.) as of December 29, 1931.

stronger hyperopic cylinder, bringing the vision to normal.

Present ocular examination: The patient appeared on December 24, 1931, complaining of inability to read. Six pairs of glasses had been used in the past year, and the lenses had been turned at various angles. Vision in the R.E. was 20/200; in the L.E. 20/100. With glasses vision in the R.E. was unimproved; in the L.E. it was brought up to 20/40—2. An examination of the eyes showed them to be normal except for keratoconus.

Retinoscopy: R.E. —2.00 D. sph.  $\approx$  —5.00 D. cyl. ax. 45°; L.E. no sph., —2.50 D. cyl. ax. 165°.

Trial Case: R.E. —0.50 D. sph.  $\approx$  —7.00 D. cyl. ax. 40°, permitting vision of 20/20—; L.E. —2.00 D. sph.  $\approx$  —3.50 D. cyl. ax. 112½°, permitting vision of 20/20—3.

At postcycloplegic examination the same strength of lens was accepted as at the trial case but a different axis.

On February 4, 1932, a contact lens, 8.1 for the right eye, gave visual acuity of 20/15 minus 4 letters.

On July 29, 1932, the patient desired a contact lens for the left eye. The vision of the left eye is distorted when compared with that of the right eye while contact glasses are worn. The patient wears the glass at least half a day at a time. Left eye contact glass with +1.50 D. sph. gives vision 20/15—.

The patient moved to California.

Case 2. H. B., a white female, aged 43 years, returned on July 19, 1932. She was nervous, underweight, had a skin eruption, her teeth were in poor condition, and the general body tone was below par. She had been told that she had cataracts. The family history was essentially negative.

Ocular history: The eyes of this patient had been failing for the past two years. In the past six months the glasses were

changed frequently; glasses prescribed one day did not fit the next day. The doctor wanted to operate for cataracts.

Previous ocular examination was made on October 10, 1920, when the patient was 31 years old.

With the following prescription, R.E. +0.12 D. sph.  $\approx$  +0.62 cyl. ax. 15°, L.E. +0.25 D. sph.  $\approx$  +0.37 cyl. ax. 65°, vision in each eye was 20/15—1.

Externally the eyes and fundi were normal. Previous extensive examinations had revealed serologic tests, the urine, blood, and stool to be normal. A previous physical examination (with chest and gastro-intestinal X-ray examinations) had indicated the patient to be normal with the exception of the skin eruption. Her present glucose tolerance test was as shown in chart 2.

Present ocular examination: Lids: A brawney, scaly, elevated eruption on the right and left, upper and lower lids and cheeks, made the turning of the lids difficult. Otherwise the ocular examination revealed normal eyes with the exception of typical keratoconus.

Vision was R.E. 6/200, L.E. 6/200. The patient was wearing over the R.E. +5.00 D. sph.  $\approx$  —8.00 D. cyl. ax. 60°; over the L.E. 0.00 D. sph.  $\approx$  —9.00 D. cyl. ax. 80°.

Manifest R.E. —4.25 D. sph.  $\approx$  —7.50 D. cyl. ax. 90°, bringing the vision up to 20/40; L.E. +0.50 D. sph.  $\approx$  —8.50 D. cyl. ax. 110°, improving vision to 20/30.

Retinoscopy: R.E. —4.00 D. sph.  $\approx$  +6.50 cyl. ax. 180°; L.E. —4.00 D. sph.  $\approx$  +6.00 cyl. ax. 180°.

Under homatrophine cycloplegic the following contact glasses were accepted: R.E. 8.1 contact lens with +4.00 D. sph.  $\approx$  +0.75 cyl. ax. 95°; L.E. 8.1 contact lens with +4.75 D. sph., no cyl. Vision in each eye was 20/20+.

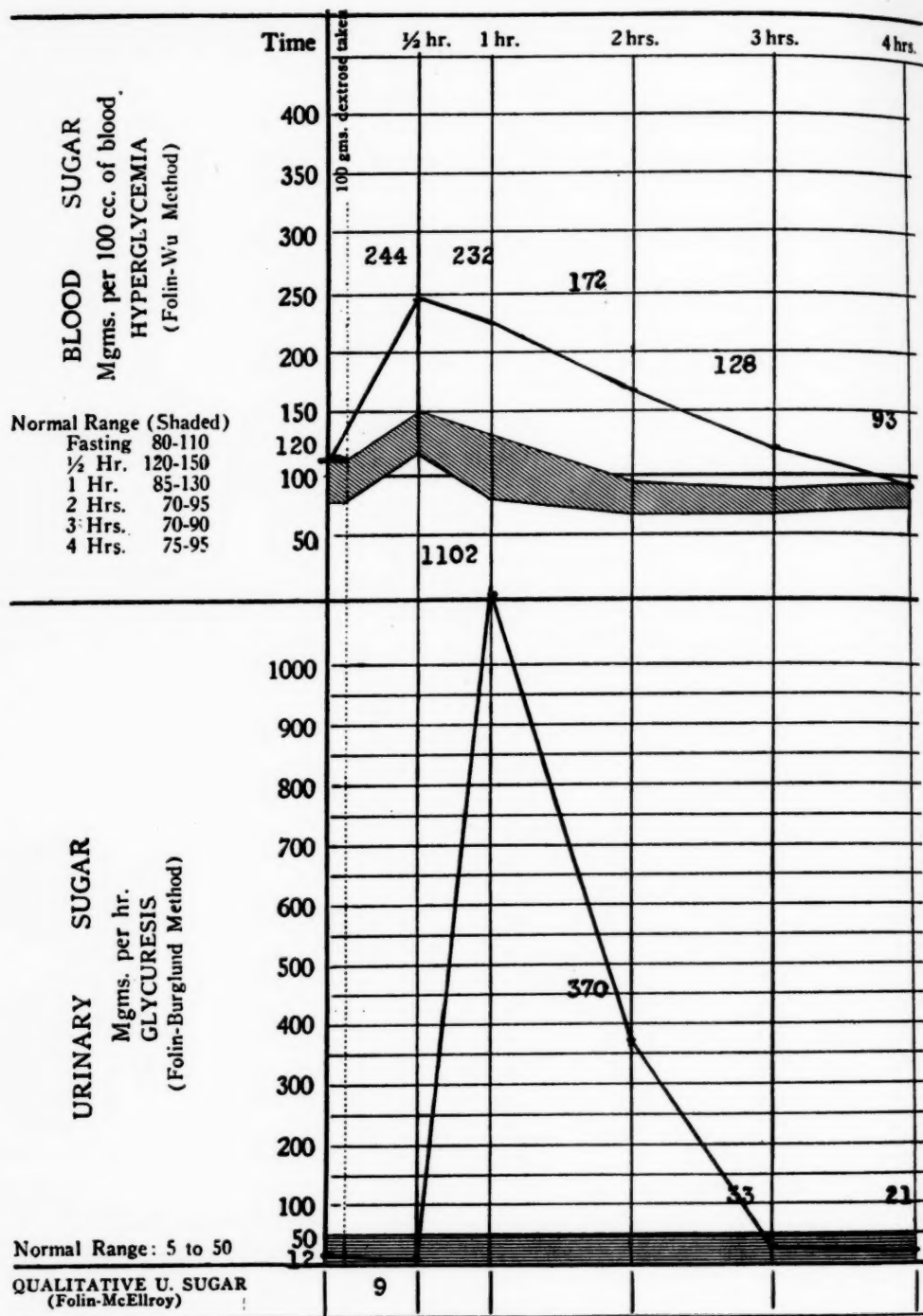


Chart 2 (Dodge). Glucose-tolerance test in case 2 (H. B.) as of July 27, 1932.

The patient went to another doctor in another city and subsequently committed suicide.

*Case 3.* N. B., a white male, aged 29 years, stated that his sister has the same trouble that he has.

Physical examination: Weight 130 pounds; height 5 feet, 8 inches. The patient is undernourished, his skin is fair in tone and color. He takes cold easily and has a sore throat rather frequently.

History: In 1927 he first obtained glasses and has had to change glasses once every five months since. The axis of his glasses has had to be changed frequently in the interim. Now, the lights at night appear to him to have a tail like a comet on them. The light itself is clear and the tail varies with the distance from the light. The tail extends downward from the light. Vision during the day is now very poor.

Ocular examination: Vision in the R.E. = 9/200, in the L.E. = 11/200. With glasses vision is improved to R.E. 20/100, L.E. 20/30.

Inspection and palpation: The ocular adnexa were normal. The cornea manifested a greater curvature than normal, conical in shape. The irides were gray; the pupils round, reacting to light, consensually and directly, and to convergence. In the right eye the conical cornea exhibited a very slight opacity at the apex. A thinning of the central portion of the cornea was observed.

Ophthalmoscopic examination showed medullated nerve fibers below the right nerve; otherwise the fundi were normal.

Refraction: On May 15, 1936, vision was 20/30-2 in the right eye and 20/20-2 in the left eye with the following correction: R.E. -0.12 D. sph.  $\oplus$  -5.00 D. cyl. ax. 165°; L.E. -1.75 D. sph.  $\oplus$  -4.00 D. cyl. ax. 118°.

There was also four degrees of vertical muscle imbalance. Visual-field examina-

tion was normal as to both form and color. A slight enlargement of the blind spots was observed.

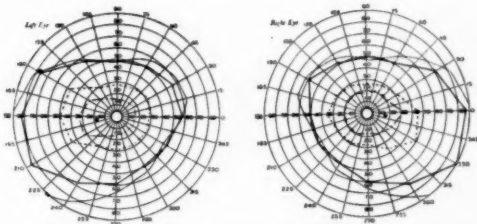


Fig. 1 (Dodge). Visual fields in case 3 (N.B.) as of June 4, 1937: 1½ mm. test object. Solid line = form field; broken line, the field for blue; dot-and-dash line, the field for red.

Further tests showed a basal metabolism of minus 7 and minus 5; the chest examination and X-ray studies indicated the presence of enlarged hilus glands only. There was recurrent tonsil tissue.

Antuitrin medication was begun on May 15, 1936.

Glasses and vision were checked on March 22, 1937. No change in the lens strength was indicated; visual acuity was undiminished.

When there is an apparent drop in the visual acuity, an injection of 1 c.c. of antuitrin brings up the vision to the former acuity.

*Case 4.* Mrs. T. H., a white female, aged 40 years, had had a previous ocular examination on March 3, 1927. Her vision had been poor for 12 years with photophobia. At that time vision was R.E. 20/200, L.E. 15/200; with glasses, R.E. 20/70+1, L.E. 20/200.

The cornea was conical in each eye. The gross color fields were somewhat diminished. There were two vacuoles in the periphery of the right lens.

Refraction: With R.E. -0.25 D. sph.  $\oplus$  +1.50 D. cyl. ax. 180° vision was 20/40-2; L.E. -0.25 D. sph.  $\oplus$  +3.00 D. cyl. ax. 180° vision was 20/40.

Basal Metabolism: Minus 12 and minus 11.

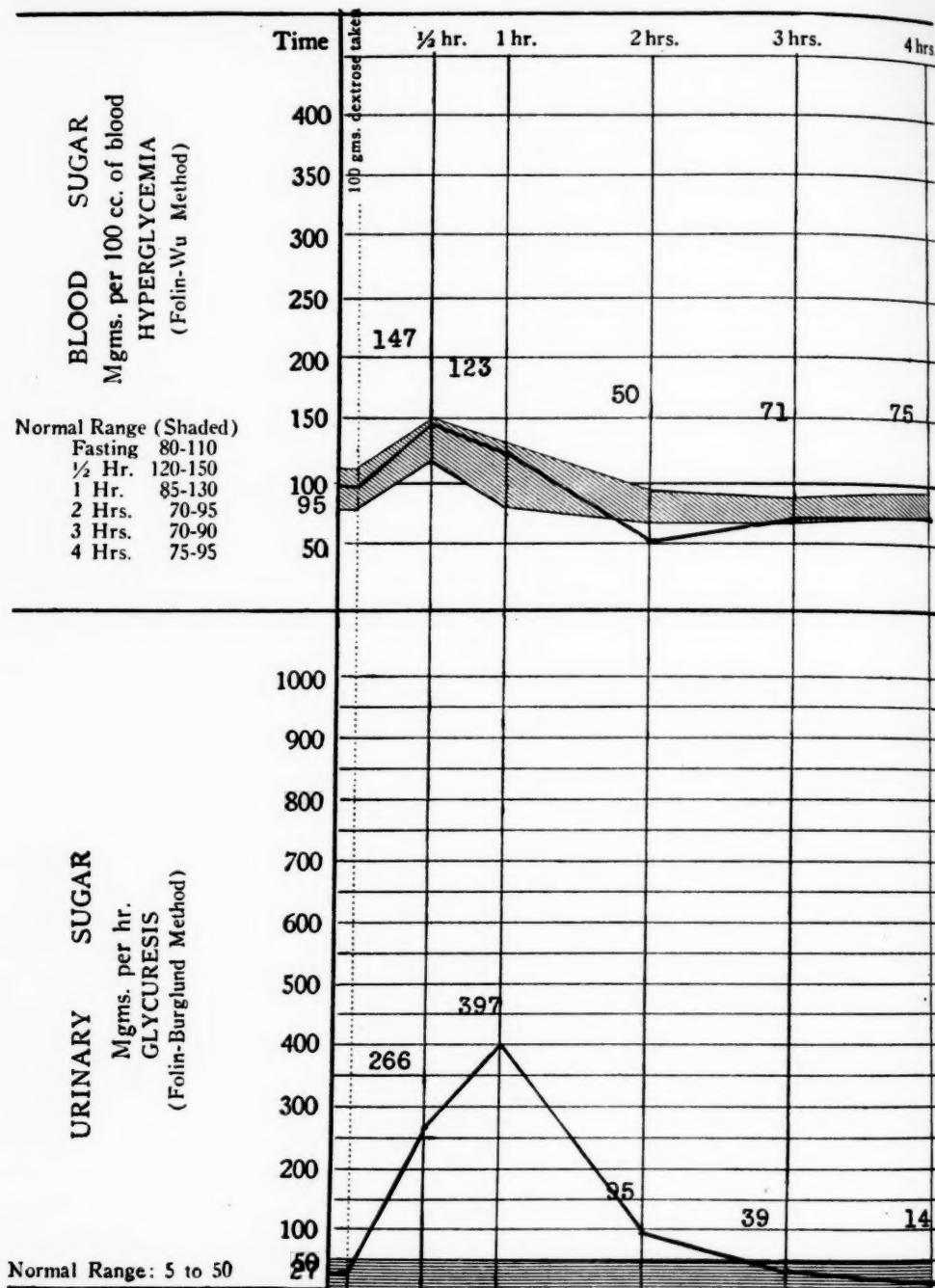


Chart 3 (Dodge). Glucose-tolerance test in case 3 (N. B.) as of May 17, 1936.

Present ocular examination: On March 2, 1936, the patient returned for an ocular examination. Vision in the R.E. was 10/200, in the L.E., 8/200; with glasses R.E. 11/200, L.E. 12/200.

Ocular findings were as before, confirmed with the slitlamp.

Refraction: On March 5, 1936, with R.E.  $-3.50$  D. sph.  $\approx +4.50$  D. cyl. ax.  $180^\circ$  vision was 20/30; L.E.  $-1.50$  D. sph.  $\approx +3.50$  D. cyl. ax.  $180^\circ$  vision was 20/100.

Contact glasses were prescribed as follows, and are worn for four hours twice a day: R.E. 7.1 with  $+1.00$  D. sph. 11 mm. from cornea, vision = 20/30; L.E. 2.71 with  $+0.50$  sph. 11 mm. from cornea, vision = 20/30—2.

Refraction: On May 12, 1937, with R.E.  $-3.25$  D. sph.  $\approx +4.50$  D. cyl. ax.  $177^\circ$  vision = 20/30; L.E.  $-1.75$  D. sph.  $\approx +4.50$  D. cyl. ax.  $178^\circ$  vision = 20/50—1.

Case 5. F. F., a white male, aged 27 years, presented himself on April 4, 1937. His general development was fair, his skin fair in tone and color. The blood picture showed an increase of the lymphocytes. The results of a fluoroscopic

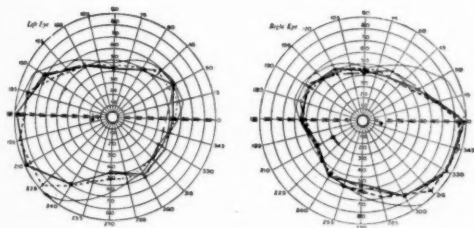


Fig. 2 (Dodge). Visual fields in case 5 (F. F.) as of June 12, 1937:  $1\frac{1}{2}$  mm. test object. Long-dash line = 50 ft.-candles illumination; solid line = 10 ft.-candles illumination; short-dash line = 1 ft.-candle illumination.

examination of the chest and of all laboratory examinations made were normal.

Ocular history: The patient suffered a sudden loss of vision two years ago, over a period of one or two days.

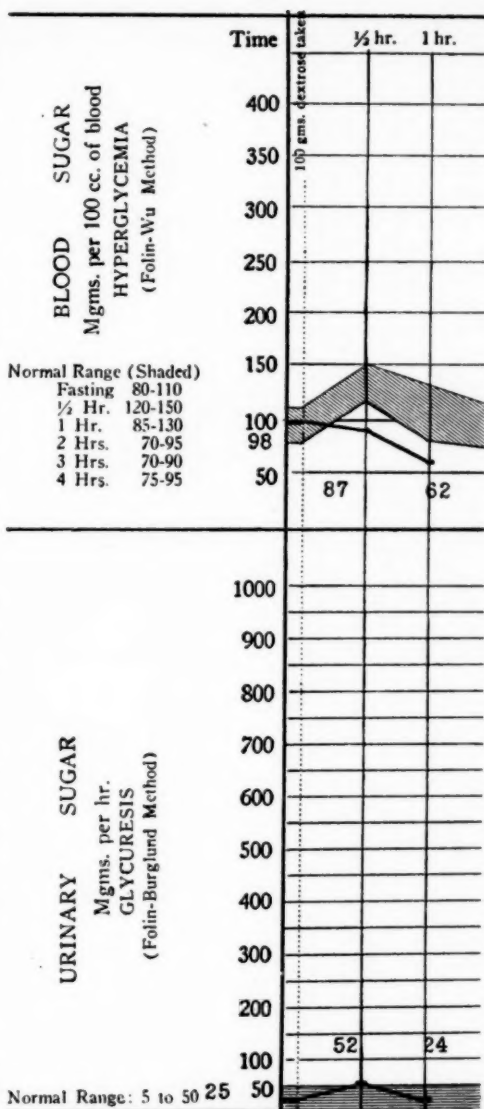


Chart 4 (Dodge). Glucose-tolerance test in case 3 (N.B.) as of December 13, 1936

Examination: Vision in the R.E. was 15/200, in the L.E. 20/50+2; with glasses, wearing a correction for mixed astigmatism of moderate degree, R.E. 20/200, L.E. 20/30—2.

The cornea of each eye showed a typical conical configuration, more advanced in the right, with faint nebulae at the apex of each cone. The lenses exhibited

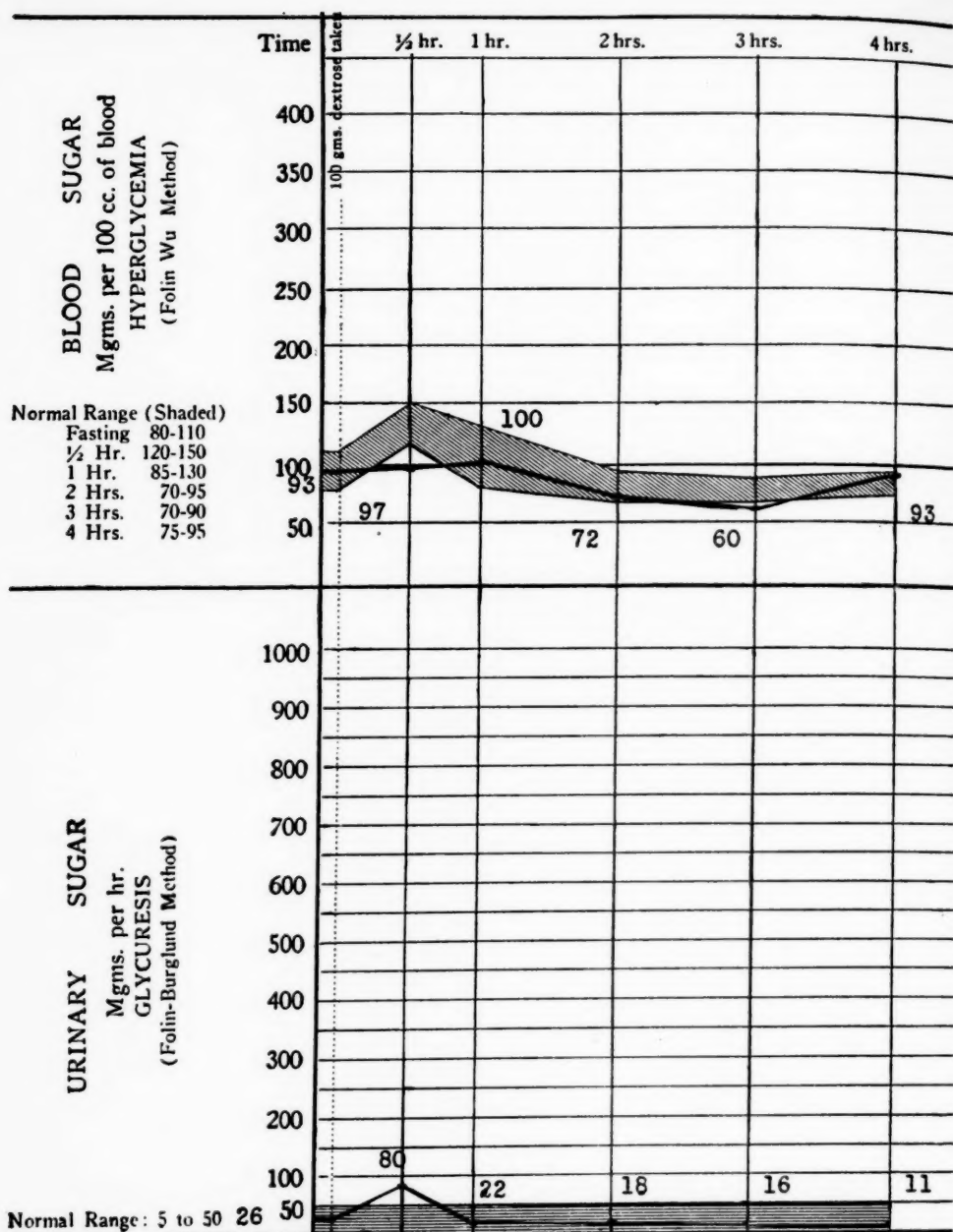


Chart 5 (Dodge). Glucose-tolerance test in case 3 (N. B.) as of April 8, 1937.

congenital opacities in the infantile band at the periphery of each. There was a remnant of the hyloid artery on the right lens. The remaining portion of the eyes were normal.

Refraction: Vision with R.E. +1.25 D. sph.  $\ominus$  -3.50 D. cyl. ax. 50° was 20/30; with L.E. +0.25 D. sph.  $\ominus$  -1.75 D. cyl. ax. 105° it was 20/30.

Quantitative visual field studies in 50

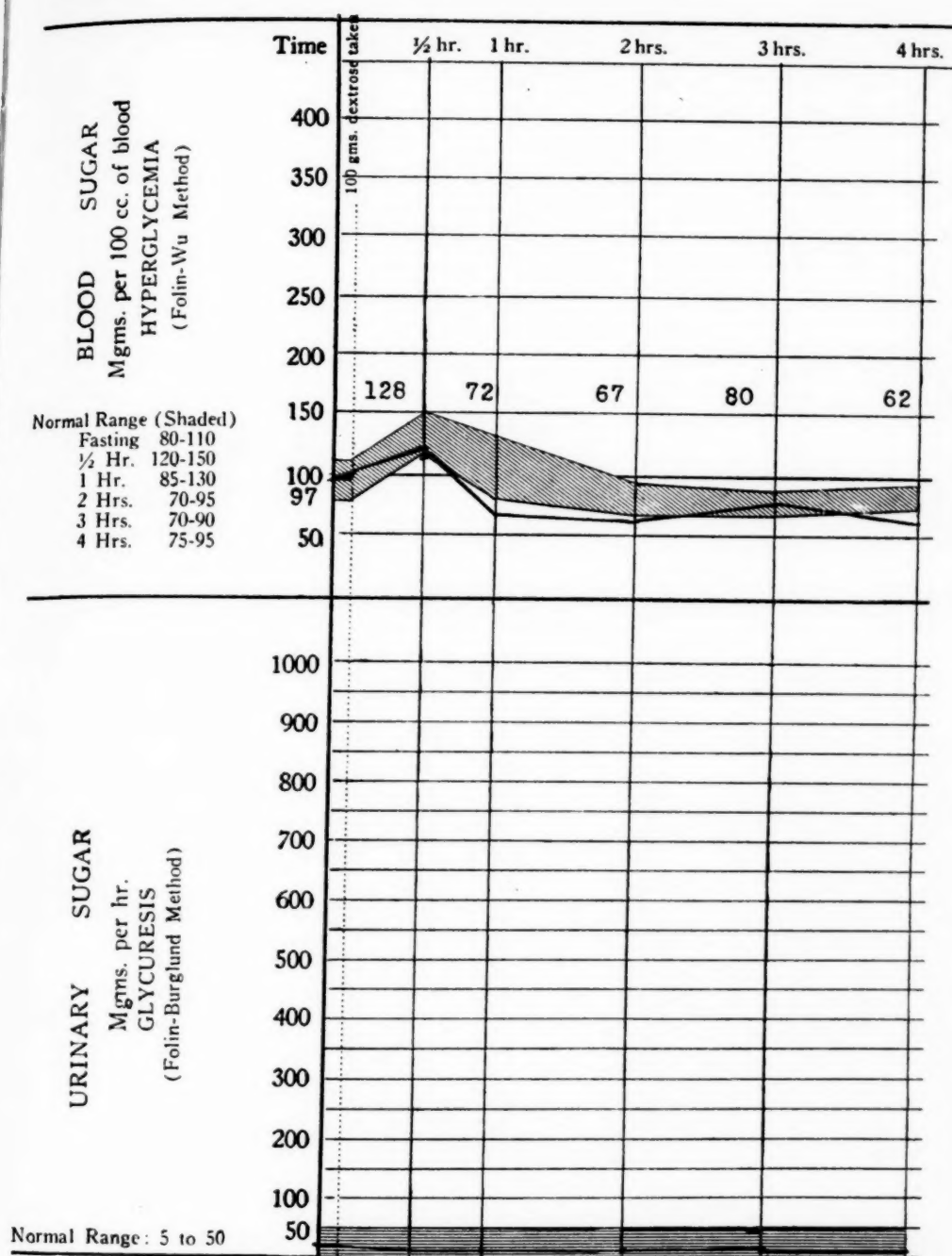


Chart 6 (Dodge). Glucose-tolerance test in case 4 (T. H.) as of April 5, 1937.

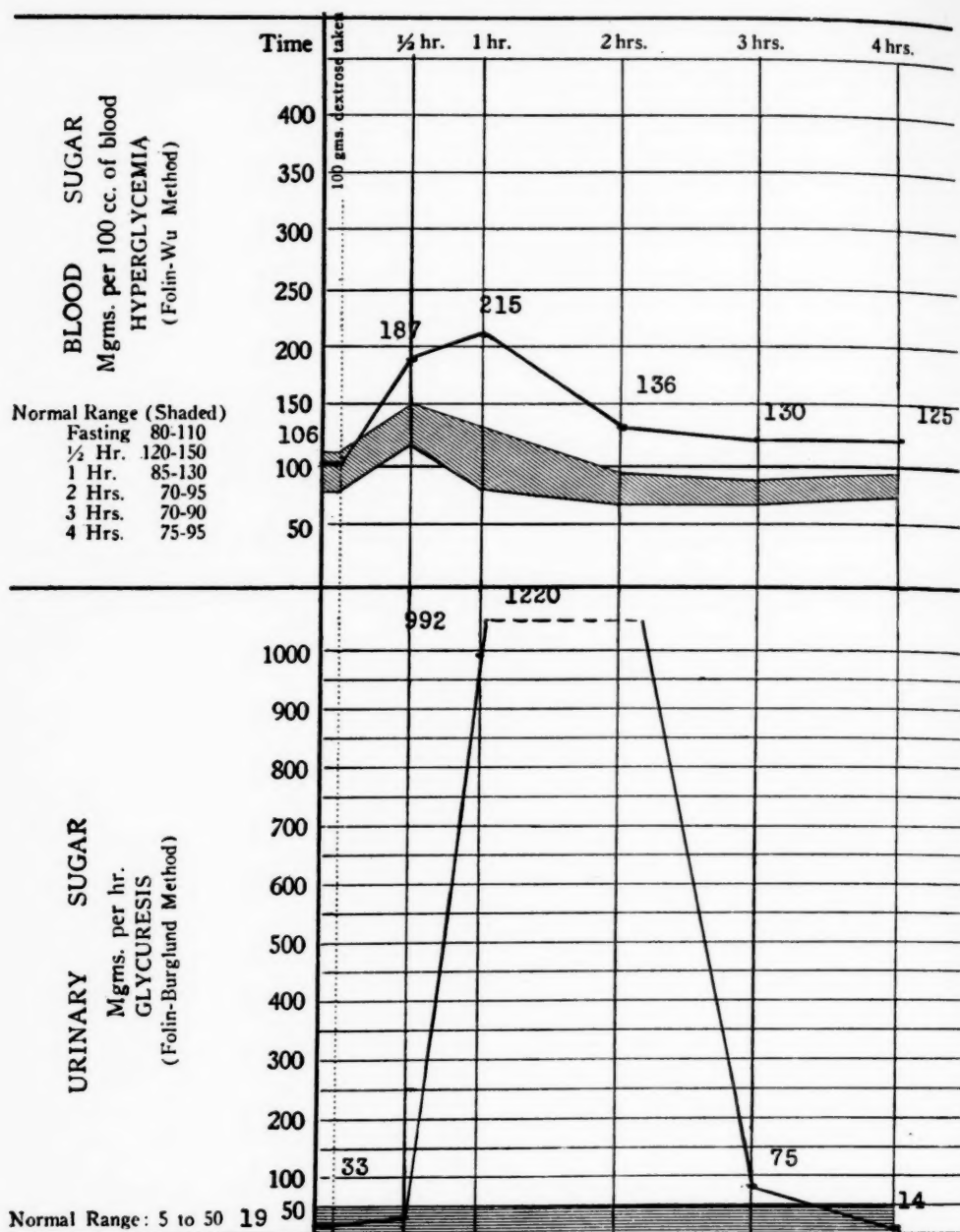


Chart 7 (Dodge). Glucose-tolerance test in case 5 (F. F.) as of March 21, 1937.

foot-candles, 10 foot-candles, and 1 foot-candle of illumination showed no variation.

#### SUMMARY

A study of these five cases of keratoconus reveals a typical history, refraction

findings, and corneal picture. The glucose-tolerance curve, with urinary sugar determination by the Folin Burglund method shows an abnormal and unusual urinary excretion of sugar. This urinary excretion is due to a low renal threshold, sug-

gesting pathology in the pituitary gland or the region of the floor of the third ventricle.

A series of antuitrin injections was given the two patients who could be kept under control. In both cases there has been an apparent cessation in the progress of active keratoconus; in case 3 for one year, the refraction becoming stationary in six weeks. The second case became

stationary as to the refraction at the end of nine weeks. This case has been under observation for too short a period to allow permanent conclusions to be drawn.

Many of these observations were begun at the Battle Creek Sanitarium and I am indebted to this institution for its coöperation in supplying the case histories and many of the laboratory examinations.

419 City National Bank Building.

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## SULFANILAMIDE IN OPHTHALMOLOGY

WITH REPORT OF A CASE

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*Chicago*

The recent reports appearing in the general medical literature and the discussion created among practitioners for the past few months on the use of sulfanilamide in the treatment of various bacterial infections have been interesting if not wholly illuminating. The more recent report of Harvey and Janeway\* on the apparent development of three cases of acute hemolytic anemia in the course of the use of this drug would tend to suggest caution and close attention to the blood picture during its administration. It is unfortunate that more definite information is not available as to its toxicity, dosage limits, reactions, and probable latent manifestations. When first presented to the profession, its administration was advocated only in the beta-hemolytic streptococcus infections but reports are rapidly accumulating of its value in infections due to other organisms. Its ultimate value as a therapeutic agent in ophthalmology must for the time, at least, remain an open question; however, when confronted with a serious infection it would seem from the report following well worth one's consideration.

Recently this reporter was requested to see a virulent case of orbital cellulitis, apparently of metastatic origin. Because of the history elicited and the clinical picture presented, he concurred in the continuation of the use of this drug, and even when the patient developed moderate cyanosis urged an increase in its administration; fortunately the case terminated favorably.

Ordinarily, an orbital cellulitis (the writer's diagnosis) may resolve happily,

leaving little or no evidence of its previous presence, or may terminate in optic atrophy, severe iridocyclitis, phthisis bulbi, and loss of the eye, but it seldom terminates in loss of life. In this case, loss of the eye was of minor import; life was the major objective.

### CASE REPORT

C. D., aged 22 years, a white male, occupied as a shipping clerk, gave the following history: On June 4, 1937, he noted a small pimple on the left side of his face, which increased in size slowly. Five days later he visited his physician, who ordered a 25-percent erythema (gamma irradiation) dose of radium and suggested hot applications to be used at home. The furuncle was not incised but opened spontaneously. A constant frontal headache developed, which increased in severity, and the patient felt too sick to go to work. During the day he had three or four severe chills lasting about 15 minutes. On June 11th, he complained of stiffness of the neck and vomited several times. He was again seen by his physician, who ordered him into the hospital at once, where he arrived about 7:00 p.m.\*\*

The house surgeon's findings upon the patient's entrance were recorded as follows:

Eyes: The conjunctiva is injected, the pupils are round and equal, and react to light and in accommodation. The nose is negative for pathology. The ears are filled with cerumen.

\*\* Author's note of Sept. 24, 1937: The patient at this time has no recollection of what transpired during the first three weeks of his hospitalization.

\* Harvey and Janeway. Jour. Amer. Med. Assoc., July 3, 1937, p. 12.

The face is markedly flushed, the skin very hot. There is a furuncle on the left side of the face just below and in front of the ear, with slight edema about this region. The lips are dry, the tongue dry and coated white.

In the mastoid region there is medium tenderness on the left side. The neck shows medium rigidity, and there is pain on palpation over the left side and when passively flexed. The glands and thyroid are not palpable.

The chest and heart are essentially negative except that the heart tones are louder than normal.

The abdomen shows slight distension with tympanitis throughout; otherwise it is normal. The genito-urinary system is essentially normal.

The reflexes are exaggerated; Babinski's negative. There are fine tremors of the hands and fingers.

The skin shows a mild eruption throughout; no petechiae.

The temperature is 101.2°F., the pulse 100, the respiration 24.

The blood findings were leukocytes 18,500; neutrophils 91 percent; red blood cells 4,500,000; hemoglobin 85 percent. Upon spinal puncture a clear, transparent fluid spurted out under definitely increased pressure. The headache was slightly increased following the drainage of about 30 c.c. of fluid.

Impression: 1. Meningitis from infection on left side of face. 2. Cellulitis of left side of neck. 3. Parotitis.

At 9:00 p.m. the patient was given an intramuscular injection of 10 c.c. of Prontosil (trade name), sulfanilamide solution. After two hours 15 gr. of sodium bicarbonate was administered by mouth. At 12:00 midnight another injection of 5 c.c. of Prontosil was given and 15 gr. of sodium bicarbonate.

By 2:00 a.m. (June 12th) the patient's temperature had risen to 103°F., and two hours later was .2 higher, but at 6:00

a.m. it had dropped to 102 degrees, the pulse was 100, and the respiration 24. The temperature continued to go down. At 10:00 a.m. it was 100 degrees, the pulse 72, the respiration 18. At this time the 5-c.c. injection of Prontosil (intramuscularly) together with 15 grains of sodium bicarbonate by mouth was repeated.

The patient felt worse. There was a moderate swelling of the right side of the face extending below the lower jaw margin.

At 8:00 p.m. sulfanilamide, 10 gr. by mouth, was ordered to be repeated every four hours.

On June 13th, at 6:00 a.m. the temperature was 102.6 degrees, the pulse 100, and the respiration 20. The nurse noted that the patient could not open his right eye. Later in the morning the patient stated that he felt much better. The headache, nausea, and vomiting had disappeared. The swelling of the right side of face and in the region of the parotid gland increased and there was more tenderness on palpation. The right eye was almost completely closed by edema of the lids. The eyeball appeared to be normal, also the motion. The patient had difficulty in opening the mouth widely.

At 10:00 a.m. of June 14th, the temperature was 101.8 degrees, the pulse 104, the respiration 22.

This reporter was requested to see the patient at this time and found the following *ophthalmic condition*:

The right eye was markedly proptosed; the lids taut and bluish; the eyeball not replaceable on pressure. There was marked limitation of motion, and a mild chemosis of the conjunctiva. The pupillary reflexes to light, in accommodation, and consensually were good. The left eye was essentially normal.

The fundus as observed through the undilated pupil was apparently normal. The pupils were ordered dilated with

homatropine for more detailed examination. This was undertaken at 5:00 p.m.

*Fundus examination:* The pupils were equally and well dilated. The nerve head of the right eye was well defined; there was *slight pallor*, the physiologic cup being normal. The veins were slightly tortuous; the arteries and retina normal.

The nerve-head margins of the left eye were slightly blurred in the lower temporal quadrant. Small hemorrhages may have been present in this region. The veins were slightly tortuous, the arteries normal. Pressure on either internal jugular vein did not alter the retinal circulation. Diagnosis: Orbital cellulitis of the right eye and possibly beginning optic neuritis of the left eye.

The patient was seen by Dr. Ernest Nora (internist) who reported as follows: Babinski's, Kernig's, and Brudzinski's signs are negative. There is no meningitis. Another spinal puncture was ordered by the internist, which disclosed a cell count of 120, lymphocytes 8, neutrophils 92, erythrocytes 0. The smear showed no bacteria. The smear from the abscess disclosed staphylococcus. Spinal-fluid and blood cultures were made. Diagnosis: Cavernous sinus thrombosis. It was suggested that the sulfanilamide medication be continued. On June 15th, the pus from the abscess was examined; the culture showed many colonies of *Staphylococcus albus*. In the smear were many pus cells and a few gram-positive cocci. The spinal-fluid culture gave evidence of no growth after 24 hours. The blood Wassermann reaction was negative. On the same morning the patient was seen by this reporter. The proptosis of right eye had increased. The fundus of the right eye appeared to be about the same; in the left eye there was a developing papilledema, with small hemorrhages in the region of the disc. There was no pain nor edema over the

mastoids on pressure. The neck was not quite so rigid. The patient appeared brighter. That night the nurse recorded that the patient did not seem rational and appeared to be drowsy.

On the next morning the temperature was 100.8 degrees, the pulse 90, the respiration 20. The patient responded to questions and answers more intelligently. He was slightly cyanotic. The red rash on the chest had become more pronounced. On June 17th, the right eye was more proptosed. The dose of sulfanilamide was increased to 15 gr. with sodium bicarbonate. The patient was seen by Dr. Victor E. Gonda (neurologist) who reported as follows: In the right eye there was marked edema of the lids and conjunctiva. The eye was immobile. The left eye manifested a choked disc of about 2 D. There was slight rigidity of neck when flexed on the chest. The right knee flexed (Brudzinski partial); slight (bilateral) Kernig's sign; Babinski's sign was equivocal ( $\mp$ ). A slight hypo-algesia was observed on the right side.

The corneal reflexes were absent in the right eye, lively in the left. Biceps, triceps, knee, and Achilles jerks were elicited on both sides. Diagnosis: Right cavernous-sinus thrombosis (to verify this, Queckenstedt test should be performed). At 10:00 a.m. on June 18th, the patient seemed to be mentally clearer and more alert; his temperature was 98.8 degrees, the pulse 78, and the respiration 20.

*Eye examination:* The edema and proptosis were not so marked. The disc of the right eye appeared to be more pink; the veins were possibly more tortuous. A large hemorrhage was seen about two disc diameters below the disc, apparently from the lower temporal branch of the central vein. Where the arteries cross the veins there was marked knuckling of the underlying vein.

Papilledema of the left eye was possibly less marked; the veins were not so tortuous.

On the same day the patient was seen by Dr. Thomas Galloway (otolaryngologist) who made the following report: The ear drums were approximately normal. There was no pus in the nose, or inflammatory swelling or blocking to suggest sinus disease. The throat was moderately red. The parotid outlets were red and slightly patulous. The essential findings were proptosis with considerable fixation of the right eye, marked redness and chemosis of the bulbar conjunctiva, redness and thickening of right lids. Chemosis, proptosis, and fixation of the left eye seemed to be absent.

Impression: Cavernous-sinus thrombosis is probably present. Orbital cellulitis or other inflammatory infiltration could produce the symptoms. The failure of in-

On the following day the patient felt less pain in the right eye, some pain in the left eye.

*Eye examination:* The disc of the right eye appeared more pink, the tortuosity of veins was increased. In the left eye the

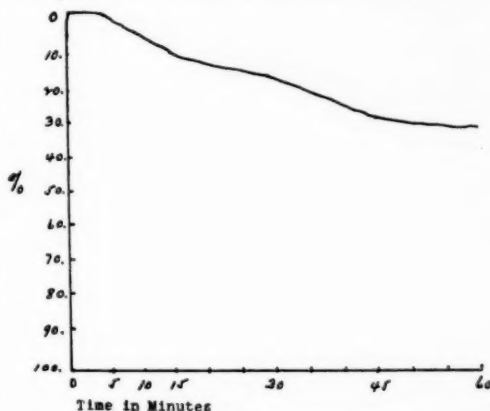


Fig. 2 (Goldenburg). Chart showing blood-sedimentation time.

papilledema was increased, about 4 D. Some small hemorrhages were seen on and around the disc. The patient experienced some pain on pressure over the left eye, although nothing was to be seen externally.

The neck was not so stiff. The patient appeared brighter mentally. On June 20th there was still pain in the left eye on pressure, absent in the right eye. The fundus findings were practically the same. The patient appeared brighter. There was no stiffness of the neck.

The dosage of sulfanilamide was reduced to 10 gr. every three hours for June 21st and to 5 gr. every four hours for June 22d. On the 24th the chemosis and proptosis of the right eye were found to be much reduced; its mobility increased. Upon examining the fundus, the nerve-head outline and color were better. No new hemorrhages had appeared. The left eye also showed decreased papilledema with no new hemorrhages. Mentally the patient was perfectly clear and alert. The



Fig. 1 (Goldenburg). The patient two days after the proptosis began to decrease.

volvement on the opposite side suggests this. Advise expectant treatment unless the patient gets worse. Then exploration for drainage of orbit would be advisable. There would be no object in ligating the internal jugular.

neurologic report on this day stated that the proptosis had almost disappeared, that there were no rigidity of the neck, no pathological reflexes, no Brudzinski or Kernig signs, no asymmetry of the face (uvula and tongue did not deviate).

During the night of the 24th to 25th, the patient awakened suddenly on two occasions complaining of feeling very warm. His temperature on the 25th ranged

X-ray examination of the chest was ordered.

Dr. H. E. Davis (roentgenologist) noted that an examination of the chest showed circular areas of infiltration about 2 cm. in diameter in the base of the right lung near the costophrenic angle and in the base of the left lung at the level of the diaphragm and near the margin of the left side of the heart. Heart and aorta



Fig. 3 (Goldenberg). Leukocyte chart. Solid line = white blood cells; broken line = neutrophils. Other leukocytes were proportional. The red blood cells showed no pathology in count, color index, or hemoglobin.

from 98.8 degrees to 99.2 degrees. The pulse 78 to 100, the respiration 18 to 26. About midnight the patient awakened feeling cold. A blanket was applied for external heat.

Upon examination by Dr. Nora (internist), an increased tactile fremitus was found over the right side of the chest posterior, at about the level of the third and fourth ribs, with a slight dullness over the same area on percussion; also increased vocal fremitus with crepitation at this point. The breath sounds were roughened over the apices. A pleural friction rub was heard at the base on both sides. Probably the result of emboli.

were normal in size, shape, and position. Other portions of lungs were apparently normal. Opinion: Probably infarct of both lungs and especially the right.

A blood culture showed no growth after 44 hours. On June 26th, the patient complained of pain in the right side of the chest. His temperature ranged from 98.2 degrees to 99 degrees, the pulse 76 to 104, the respiration 18 to 24. The pain on the right side of chest became worse on deep inspiration during the next day. The temperature was 98.2 degrees to 98.8 degrees, the pulse 76 to 102, the respiration 18 to 22.

The report of the ocular condition on

June 28th, indicated that the fundus of the right eye was improving; there were white spots in the periphery of the hemorrhage. The fundus of the left eye was also improving although the tortuosity of the vessels was still marked. The internist, on the 29th, reported that tactile and vocal fremitus were markedly diminished over the root of the right scapula; that dullness on percussion and conduction of sounds persisted on the right side anteroposteriorly.

On June 30th, the right-eyeball excursions were almost normal, the proptosis had been markedly reduced, a slight ptosis still persisting. The hemorrhage below the disc was disappearing rapidly. Papilledema in the left eye was still about 3 D.; the vessels were still tortuous but less so than previously. At six o'clock the next morning the patient complained of pain in the right arm and his inability to move it. Two days later he complained of pain behind the right ear (no findings). Dr. Nora (internist) at this time found vocal and tactile fremitus increased over the right lower lobe. A few rales persisted after coughing at the end of inspiration. There was a relative decrease in vocal and tactile fremitus above this point. Of interest was a zone of painful breathing above. His temperature and respiration were comparatively normal, but his pulse continued to be rapid.

On July 6th, the ocular examination revealed both eyes to be comparatively negative externally. In the fundus of the right eye, the hemorrhage and tortuosity of the vessels had decreased. The papilledema in the left eye was still about 3 D., with decreasing tortuosity of the vessels.

The report of an X-ray examination of the chest on July 8th, when compared with previous films showed a slight amount of infiltration still present at the level of the right costophrenic angle. The pleura at this site was considerably

thickened. Opinion: Satisfactory resolution and progress of probable infarction at the right costophrenic angle. No X-ray evidence of other pathology

On July 13th, the patient complained of pain in the right upper quadrant when he yawned or coughed, to which was added on the 18th, a sharp stabbing pain in the left upper quadrant upon breathing deeply or coughing. But by the 20th these respiratory difficulties had vanished.

Five days later the patient's temperature was 97.8 degrees, the pulse 78 to 90, the respiration 20.

The urine was essentially negative throughout the course of the disease. The specific gravity remained between 1,004 and 1,006, with an occasional trace of albumin and the presence of some bacteria.

At no time was there any evidence of red-blood-cell destruction or the presence of abnormal cells. The leukocyte count on entrance was 18,500 and reached a height of 23,200 and a low of 7,400 before the patient left the hospital. The various other white-blood-cell counts were essentially uniform.

The patient was discharged on this day (July 25th), walking out of his room without aid.

*Summary:* The high points in this case would appear to be the site of the primary lesion on the left side of the face, followed by parotitis of the right side, which became marked; and although parotitis also developed later on the left side, it was comparatively moderate. This was followed by edema of the lids and proptosis of the right eye, which became very marked. The chemosis of the conjunctiva during the height of the proptosis was moderate, but as the lids became less taut the bulbar conjunctiva increased in chemosis, which, however, did not persist very long. The fundus of the right eye when first seen was peculiar in that

the disc appeared paler than normal, and later as the proptosis decreased it became more red and at a still later date intensely red. The papilledema of the left eye, at first very moderate, increased as the patient apparently improved, reaching a height of about 4 D., which disappeared very slowly; in fact, some swelling was still present when he was discharged from the hospital apparently perfectly well. At no time was the left eye involved externally. Complete muscular function returned in the right eye with the exception of a barely noticeable ptosis of the upper lid. The patient states he sees as well as usual.

From an ophthalmic standpoint, the patient could have been dismissed on about the thirteenth day after admission. The proptosis had disappeared, muscular function had been restored, and the patient stated that his vision was perfectly normal. However, the persistence of the rapid pulse aroused the internist's suspicion, which was soon confirmed by pain in the chest and later reaffirmed by X-ray pictures, which disclosed several patches that were diagnosed as probable infarcts of the lungs, the result of metastasis of the original process, or the pathology in the orbit, or perhaps in the cavernous sinus, as the other consultants seemed to think.

Although this reporter disagreed with the consultants in the diagnosis, and the patient made an excellent recovery, it is not beyond the sphere of possibility that they were correct and the case was one of those rare instances of cavernous-sinus thrombosis that did get well. This might be attributed to the action of the sulfanilamide. Likewise, one may assume that if the case had not gone well, the ophthalmologist would have been open to criticism for not resorting to surgical interference; at least, drainage of the orbit early as was suggested. However, the case early appeared to be very serious

and the type of infection so vicious that we decided to wait until a more definite state existed to warrant surgical interference. Although the patient became mildly cyanotic it was presumed that this was due to the medication; but in view of the lack of evidence of red-cell pathology the drug was pushed further and the cyanosis soon disappeared.

The leukocytosis was interesting in its parallelism with the progress and control of the infection. At no time did the blood picture disclose any evidence of pathology of the red cells. The urinary findings were likewise interesting in that at no time was there any evidence of a disturbed kidney function. The specific gravity remained low, between 1,004 and 1,006, with an occasional trace of albumin and some bacteria.

The photograph of the patient was made about two days after the proptosis began to decrease, so that the height of the infection is not shown. The case at that time appeared too serious for us to consider taking photographs. At the time of preparing this report (August 2, 1937) there is still a slight ptosis of the right upper lid. Vision in the right eye is 20/25—3; in the left eye 20/25—2 without correction. The pupils react well to light, in accommodation, and consensually. The fundus, viewed through the dilated pupil, shows in the right eye a well-defined disc, good color, and a slight blur at the lower margin extending on to the vessels. There is no evidence of previous hemorrhage. In the left eye the disc margins are slightly blurred. There is a slate-gray-colored spot about 1 disc diameter below the disc, which was not present in the earlier examination. From the upper three fourths of the disc margin, a feathery, radiating pattern of striae extends for about 2 disc diameters; otherwise the fundus is normal.

*104 South Michigan Avenue.*

## NOTES, CASES, INSTRUMENTS

### A MERCURY-ARC REDFREE OPHTHALMOSCOPE\*

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*Saint Louis*

The term redfree light refers to visible light comprising all of the colors except red. In ophthalmoscopy the term has often been used loosely, and as a title for this paper it is not strictly accurate. The light here described is not absolutely red-free, and in certain instances a single color alone is present. The term is chosen, however, because it brings to mind a type of illumination with which ophthalmologists are familiar at least in the literature, if not in actual experience.

The usual method of obtaining redfree illumination is to filter white light. In the average hand ophthalmoscope the small incandescent lamp is not strong enough to give adequate illumination when a redfree filter is placed over it. The resulting light is so dim that one's view of the fundus is poor, so poor that, in fact, one sees less than with the unfiltered, white light. In order to get a sufficiently bright light the carbon arc has often been used. This source of light cannot be built into a hand ophthalmoscope for obvious reasons, but with the reflecting mirror ophthalmoscope it has been satisfactory. About 25 years ago Mayou used the mercury arc in this way, and the substitution was very effective, because the mercury-arc light is inherently free from red and thus requires no filter. But the reflecting ophthalmoscope is unhandy and both forms of arc light are sufficiently cumbersome to prevent redfree ophthalmoscopy from becoming generally popular.

In attempting to remove these difficul-

ties from the apparatus, the writer about five years ago connected a mercury arc to the Bausch and Lomb binocular ophthalmoscope. As a laboratory model the machine worked very well and was first mentioned in an editorial appearing in the *American Journal of Ophthalmology* for February, 1935, page 171. The instrument was still not suitable for general clinical use. With the recent advent of a new mercury-arc burner, however, the disadvantages of the earlier instrument have been removed.

The binocular ophthalmoscope built by Bausch and Lomb is a precision instrument which offers distinct advantages not found in the hand ophthalmoscope. Increased magnification is one such advantage. The chief feature of the instrument, however, is that it affords a stereoscopic view of the fundus, which is invaluable in localizing depth. The appreciation of different levels in the fundus is a decided refinement over the view given by the hand ophthalmoscope, which at best allows only for an estimate of the depth of a lesion.

The new mercury arc used in this instrument\*\* has only recently been placed on the market by the General Electric Company. The lamp screws into an ordinary socket, but requires a special transformer for its operation. It consumes 85 watts, is extremely efficient, and actually radiates a light slightly greater in intensity than the ordinary 200-watt incandescent lamp (as measured by a photoelectric cell). Of special importance is the concentration of energy in two regions of the spectrum (to be described); thus, with filters it is possible to get an extraordinarily intense monochromatic

\*From the Department of Ophthalmology, Washington University School of Medicine.

\*\*The mercury-arc illuminating attachment is manufactured by the Bausch and Lomb Optical Company.

light. With the same filters covering a 200-watt incandescent bulb, the light is far from monochromatic and is very much less intense.

Pure white light when viewed through a spectroscope appears as a broad, continuous rainbow. The mercury arc, on the other hand, radiates a line spectrum; that is, the light is concentrated in certain parts of the spectrum, and in other parts it is either entirely or almost wholly lacking. The mercury arc furnishes most of its visible light in the green and yellow lines of the spectrum, along with intense violet lines. Under the spectroscope there appears a small amount of red, but clinically it can be disregarded because of its weakness.

The mercury light applied to the binocular ophthalmoscope, improves the view of the fundus. The image is sharpened because of the reduction in chromatic aberration. The observed eye has chromatic aberration to white light of between one and two diopters. The same is true, of course, of the observer's eyes, and in addition, there is chromatic aberration in the instrument. This factor contributes very materially to blurring of the image. Since monochromatic light overcomes this defect, the consequent sharpness of detail is greatly enhanced. True, when using the green and yellow lines together, one does not have monochromatic light in the strict sense, but these lines lie so close together that the chromatic aberration has less effect on the blur circle of the image than does the spherical aberration of the lens system of the eye.

When using an ophthalmoscope the fundus reflex is brightest when seen with yellow-green light. On the other hand, blood, which is chiefly colored by hemoglobin, reflects strongly in the red. Thus, when the green and yellow lines of the mercury arc are projected on the fundus,

the pigment layer is brightly illuminated, while the blood columns are extremely dark, almost black. This accentuated contrast is very striking and contributes much to the improvement in the visualization of the fundus. When viewed with white light a narrow column of blood (such as a capillary) will be almost orange; but when viewed in redfree light, the column becomes practically black and is suddenly rendered very plain against the yellow background. The yellow-green light is most suitable for studying the blood vessels and the choroid, both because it presents the contrast just mentioned and because these relatively long waves penetrate well.

The retina under white light is transparent, but when viewed with light of shorter wave lengths, in the neighborhood of the blue-green, it becomes visible because these rays are less penetrating. A suitable filter, therefore, brings out this portion of the mercury spectrum for studying the retina itself. The retina is plainly seen also with the unfiltered mercury light because of the intensity of the violet spectral lines.

Our present standard of color interpretation of the fundus is based on light from an incandescent globe. While this light is called white light, it is decidedly different from "daylight," for it is especially intense in the yellow and red part of the spectrum. Clinically we see this difference when examining the conjunctiva under artificial light and again before a window. The color values of the fundus examined by the mercury light are distinctly different from those seen by the incandescent light. Hence, details in structure are to be studied with the mercury light, and we should continue to accept the incandescent "white" light as standard for color evaluation because of the fact that it is the one in universal use. It is my practice in routine clinical work first to use the hand ophthal-

moscope to survey the entire fundus and then to use the mercury-arc illumination with the binocular ophthalmoscope for studying pathological areas or regions that are questionable. The mercury illumination is especially suited to the study of the yellow spot (macula lutea), well named under this illumination, for the yellow pigment stands out brilliantly with the mercury light.

It is true that the binocular instrument is far less convenient than the hand ophthalmoscope. As a table instrument its disadvantages are comparable to those of the slitlamp; yet no one can deny the importance of biomicroscopy. After all, the slitlamp is not new, merely focal illumination. After training and practice with it we can see more detail and earlier pathology than hitherto, and the same may be said for this ophthalmoscope with the improved illumination. In order to bring out its advantages one must understand its correct manipulation and use it properly. A few moments taken to distinguish the illuminating system with its adjustments, as separate from the viewing and focusing system, will well repay the user in satisfaction with the results obtained.

823 Metropolitan Building.

#### A PROPOSED INSTRUMENT FOR THE OBJECTIVE MEASURE- MENT OF THE RETINAL IMAGE

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*Indianapolis, Indiana*

The study of aniseikonia has made it necessary to devise ways of measuring the size of the retinal image in each principal meridian. The means at present employed for this purpose involve the use of a complicated, bulky, and expensive instrument which, in its use, depends upon the subjective response of the pa-

tient for the determination of the measurements desired. There would be an obvious advantage in an instrument for this purpose which is simple, compact, inexpensive, and entirely objective in its operation. Such an instrument I have designed but not yet constructed. I herewith submit its tentative plan.

The source of illumination is the lamp, La, which is supplied with regular city current through the cord and plug, c. Its filament, as illustrated in insert No. 1, is constructed in the form of a cross, each arm of which measures 20.0 mm. The filament serves as the object, OO', from which diverging rays of light pass to the plano-convex lens, C. After passing C these rays are parallel. The parallel rays strike the mirror, MM, which is angled at 45 degrees, and are deflected at right angles into the eye under observation, E. E is in a state of complete cycloplegia and a lens, l, correcting any existing ametropia, is in place before it; hence the parallel rays derived from the object, OO', are focused upon the retina to image the point O at I and the point O' at I'.

The points I and I' in the eye, E, serve also as object points from which the rays of light, upon emerging from E, retrace their entering paths. Some of these rays, upon reaching the mirror, MM, pass through the aperture, A, to strike the plano-convex lens, L. These rays are focused by L at its focal point to form a real image of II' at HH'.

The microscope, Mi, when moved upon the rack, R, by the pinion, p, so that its objective lens, l', is at a distance from the real image, HH', equivalent to the focus of the instrument, will cause a real image of HH' to be formed at KK', a situation corresponding to the position of the graticule, G. The graticule, G, as illustrated in insert No. 2 consists of tenth-millimeter squares. The eye-piece, l'', of the microscope, Mi, will deflect the

light rays originating from the real image,  $KK'$ , and the graticule,  $G$ , so as to form a virtual image of  $KK'$  and the graticule at  $JJ'$ .

cule in each of the two principal meridians. If this measurement is made in each eye, the eye being in a state of full cycloplegia and its visual line directed

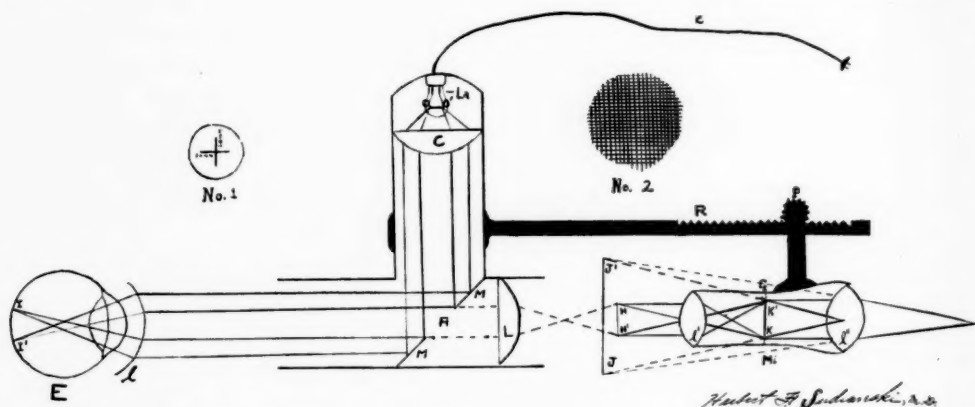


Fig. 1 (Sudranski). Diagram of proposed instrument for the objective measurement of the retinal image.

The observer will view, through  $M_i$ , a virtual image of  $II'$  projected against the graticule. Since  $II'$  is the retinal image of  $OO'$ , which is constructed in the form of a cross, it follows that the arms of the cross may be measured against the grati-

towards the center of the cross imaged in the mirror,  $MM$ , any difference in size of the images in corresponding meridians may be recognized and, by simple calculation, expressed in terms of percentage.

522 Hume-Mansur Building.

# SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

## ROYAL SOCIETY OF MEDICINE LONDON

### SECTION OF OPHTHALMOLOGY

February 12, 1937

MR. W. H. McMULLEN, *president*

#### CONCERNING THE ACTS OF CLOSING AND OPENING THE EYES

SIR ARTHUR HALL (Sheffield) said that his interest in the subject commenced with his observation of the curious attacks seen so often in chronic epidemic encephalitis. These strange eye movements had been said to occur in 20 percent of the cases of Parkinsonism. In 384 cases of that disease 15 percent had these movements, but he thought that was less than the usual proportion, for in many the attacks occurred only a long time after the Parkinsonism came on. In these attacks there was a temporary turning up of the eyes, with various other symptoms, and altogether it was a very curious form of attack which was not met with until epidemic encephalitis appeared. There are, however, at least two other forms of ocular attack: one a fixation of the gaze, the sufferers from Parkinsonism being unable to take their gaze away from some object. These he did not propose to speak of. Some very interesting work on this condition had recently been published by Dr. Gordon Holmes. In addition to the oculogyric attacks, many of these patients had attacks in which they could not open their eyes, and those attacks might alternate with oculogyric attacks with the eyes wide open. These, he felt, were very closely related. The extraordinary feature about these people whose eyes closed was that they could do so by merely touching the lid with the hand. But in the third stage of

the disease the patient was unable to lift his arm high enough to touch his eyelid. A friend could touch the lid, and then the eye opened.

In the oculogyric attack the eyes did not always turn up; sometimes they turned partly up and partly down, or turned up to one side, and in none of them was there any marked wrinkling of the forehead.

There were certain regulations which must be observed by the eyes when a pattern was formed for binocular vision; the two eyes must act together, they must always be in a state of attention, and the pupils must be kept clear of the eyelids. So the normal person, exercising ordinary vision, can not move his eyes so that the pupils are hidden under the lids whilst the eyes are open. In the case of a young doctor he noticed that when the lids were touched the eyes went right up under his lids. This was a trick which he had learned when a boy. One of his subjects could move either of her external recti without moving the other, and, if she so desired, she could move both at the same time. Sir Charles Bell in 1823 gave a description of what happens to the eyes when they close. An investigation of the eyes in 223 cases showed that they were right up in 65 percent, straightforward in 29.5 percent, down in 3 percent and to one side in 2½ percent. In children, the proportion in which the eyes were right up was not so great as in adults. In the few blind children examined the proportion was still smaller.

It is clear, therefore, that the eyes may be in almost any position during sleep. In the first 10 days of the infant's life the upward position is very rare; that is before ordinary binocular vision has been acquired. There are three ways of investigating this. First, there are cases of facial

palsy, but they are very few. Second, there are people with transparent lids; in some the lids are so transparent that one can see the position of the eyes under the lids, though not at the moment of closing the eyes. Third, it can be done by holding one lid open of a person who is normal, he meanwhile resisting the opening of the lid. There is an interference with the physiological action, and in some people it is sufficient to upset the action completely.

The eye movements, when the lids are closed, can be divided into three types, according to the quantitative ascent of the eyeball: (1) very high, (2) less high, the lids being held, (3) when they do not go up at all, and may go down. In 900 cases 58 percent were of type one, 32 percent of type two, 10 percent of type three. Type one movements could be compared with a spring blind (as soon as the spring is released the blind darts up). When a person winked there was a different action: he used the orbicularis on one side only, and the eyes did not move. Therefore when one was testing these people it was important to make sure that the eyes were being properly shut, and that the person was not winking.

#### CONGENITAL RETINAL FOLD

MR. ADRIAN CADDY said the patient was a schoolgirl, aged 13 years. Her right eye showed a retinal fold extending from the disc outwards towards the periphery of the fundus, in the direction of the 8-o'clock position. The eye was slightly divergent, and no vessels were seen.

*Discussion.* Miss Ida Mann said that if the drawing was an accurate one she did not regard this as a case belonging to the group of congenital retinal fold. In the cases of that condition which had been described there were branches of the retinal vessels on top of the fold. They came up from the surface, and in some cases ran along the edge. In the typical cases,

the nearer the equator the more peripheral the condition became. Her suggestion was that the case now shown was primarily an abnormality, something in the vitreous which had become secondarily attached to the surface of the retina. It would not show retinal tissue there, but something superimposed on the retina.

Mr. Malcolm Hepburn said he had now under care a case similar in appearance to that now shown in that the scar tissue was choroidal inflammatory scar tissue, and the fibrous tissue went backwards in the form of a band. In the present case, however, it was not so evidently scar tissue, for there was not so much pigment proliferation as in his own case.

#### UNUSUAL OPACITIES IN THE CORNEA

MR. E. F. KING said that this patient was a married woman, aged 53 years, who attended the hospital a few weeks ago to be supplied with new glasses, when routine examination of the cornea revealed peculiar opacities. These were of two kinds: (1) featherlike opacities, chiefly in the temporal half of each cornea, just beneath the epithelium; (2) deeper and more circular opacities, at a depth greater than the featherlike ones. Apart from early senile cataract changes there was nothing abnormal to report. The nearest to this appearance to be seen was hereditary nodular corneal degeneration.

*Discussion.* Mr. T. Harrison Butler thought that all the abnormalities were superficial. To him, the condition had a calcified appearance. His view was that it was a chronic epithelial thickening.

Mr. Magor Cardell said that three or four years ago he had had a case which was of similar appearance, except that in it the opacities were all nummular in shape. The patient was 60 years of age and continued to have fairly good sight, without much change in the condition, until she died six years later.

Mr. P. Adams (Oxford) said that in a patient of his, now 25 years of age, there occurred, every now and then, a corneal disturbance which produced photophobia and lacrimation, and the cornea was raised over one or other of the spots. After a time, the condition quieted down. During the five years that he had been watching the case the condition had altered very little.

(Reported by H. Dickinson.)

### COLORADO OPHTHALMOLOGICAL SOCIETY

February 20, 1937

DR. R. W. DANIELSON, *presiding*

#### INTRAOCULAR FOREIGN BODY

DR. W. M. BANE presented Mr. R. J. W., aged 26 years, a railroad carman helper, who was examined on January 22, 1937, an hour and a half after an injury to the right eye. He had been standing about nine feet from an acetylene torch.

A small perforating wound through the wall of the eyeball was found about 5 mm. to the nasal side of the limbus of the right eye. A metallic-appearing foreign body could be seen about halfway back in the interior of the eye on the nasal side. Vision of the eye was 20/60—.

X-ray examination showed a foreign body 1 mm.  $\times$  1 mm. in size, located 2 mm. above the horizontal plane of the cornea, 7 mm. to the nasal side of the vertical plane of the cornea, and 17 mm. behind the center of the cornea.

Application of the electromagnet brought no results, so it was concluded that the foreign body could not be steel or iron. The acetylene torch is made partly of brass.

The patient was given 25 million killed typhoid organisms by vein. The inflammation subsided, and the vision improved

to 20/24 with correction. A scar could be seen in the retina at the site of the injury, but otherwise the interior looked quite well. The patient was allowed to return to work, but was given a doubtful prognosis.

*Discussion.* Dr. W. H. Crisp mentioned a case in which the foreign body was situated between the retina and the vitreous. It was clearly seen when the patient was placed in a horizontal position but disappeared from view when he was upright.

#### ECTROPION WITH BASAL-CELL CARCINOMA

DR. W. M. BANE presented Mr. W. D., aged 73 years, who entered Colorado General Hospital on September 28, 1936, because of an indurated ulcer on the right lower lid and ectropion. A diagnosis of basal-cell carcinoma was made and X-ray therapy was given on October 19th and on October 20, 1936. On February 1, 1937, the ectropion was corrected by the use of a pedicle flap. The patient was shown because of the good surgical result obtained.

#### MONOCULAR TRACHOMA

DR. W. M. BANE presented Mrs. H. W., aged 31 years, who gave a history of sudden pain in the left eye six months previously, followed by swelling and inflammation of the lids and redness of the eyeball. She was treated by a physician who diagnosed her condition as conjunctivitis. After two months of treatment, which gave the patient no relief from her symptoms, she was examined by an oculist who made a diagnosis of trachoma and treated her for a period of three months. For the past two weeks she has been treated by a local general practitioner who contradicts the diagnosis of trachoma and states that the condition of her eye is due to a blood infection. On February 19, 1937, she came to the Colorado General Hospital for examination. Vision

of the right eye was 20/20—2 and of the left eye 20/40+1. There was marked conjunctival injection of the left eye but the lids were smooth. The cornea showed a definite pannus with ulcers along the margin. The conjunctiva of the right eye was normal in appearance and the cornea was clear. Conjunctival smears showed no eosinophiles and no inclusion bodies. Physical examination and serology were negative.

*Discussion.* Dr. Melville Black agreed with the diagnosis of monocular trachoma. He has found cases of this type very resistant to treatment. They usually go on to destruction of the eye. Because he has never seen a monocular trachoma benefited by local applications, he recommended tarsectomy.

Dr. W. H. Crisp said that in this case he would not consider tarsectomy because there is no irritation of the eyeball by the upper lid. He suggested vigorous local treatment, rubbing zinc sulphate into the conjunctiva and cul-de-sac every two or three days, supplemented by the use of copper solution by the patient.

#### PARALYSIS OF THE LATERAL-RECTUS MUSCLE (TWO CASES)

Dr. M. E. MARCOVE said that in one patient a bilateral paralysis had been present since birth. There was no history of birth injury. The unilateral case developed following meningitis at the age of seven years. These cases were presented to demonstrate that there is no contraction of the antagonist muscle.

Dr. Marcove gave a review of the physiology and innervation of the ocular muscles and enumerated the central causes of abducens paralysis. He attributed the unilateral case to pressure incidental to meningitis and the bilateral case to failure of the nuclei to develop or to hemorrhages into the nuclei at birth.

These patients presented no symptoms except diplopia when the eyes were

turned in the direction of the affected muscles. Because they had learned to overcome their diplopia by turning their heads, no treatment was required. If in either case there had been nausea and vomiting or if the patients had been unable to overcome their diplopia, the O'Connor muscle-transplant operation would have been performed. This consists of cutting the inner halves of the superior- and inferior-rectus muscles free, passing them under the lateral halves of the muscles, and fastening them under the attachment of the external rectus. A 20-degree rotation of the globe is considered a good result, and usually relieves the symptoms.

The reason there is no squint in these cases is the fact that the lesions are central. The muscle itself is not injured and retains its tone, which is sufficient to keep the antagonist from turning the eye. If however, the muscle itself is injured, either by forceps or by orbital or sinus disease, the muscle loses its tone and the antagonist can easily pull against the toneless muscle, producing a paralytic squint.

*Discussion.* Dr. W. T. Brinton mentioned the fact that in focal infections, paralysis with convergence occurs and asked where the lesion in these cases is.

Dr. W. M. Bane referred to the case of a young boy in which irritation due to a brain tumor caused diplopia which gradually disappeared and was followed by an alternating convergent squint after a few days.

Dr. Marcove replied to Dr. Brinton that certain toxins such as nicotine affect the myoneural junctions. Probably this is the situation with toxins from focal infections.

#### NEVUS FLAMMEUS WITH CATARACT AND GLAUCOMA

Dr. S. GOLDHAMMER reported a case of nevus flammeus in a boy, aged 17 years, who had had poor vision in the

left eye since early childhood. He had a port-wine nevus on the left side of his face, covering the temple and most of the upper eyelid. The vision of the right eye with correction (+0.50 D. sphere) was 20/20 and of the left eye with correction (+6.00 D. sphere) was 1/200. Examination of the left eye when first seen in August, 1932, showed a normal conjunctiva, cornea, lens, and iris. The optic nerve showed no cupping. The choroidal vessels were large and there was an area of choroidal atrophy temporal to the disc, extending into the macular area. This area was bluish in color due to an increase in pigment. The retinal vessels could be seen passing over this atrophic area, which was probably a coloboma.

When the patient was seen again a year later, vision was only light perception in the left eye and the lens was cataractous. On February 14, 1936, the patient was seen again with a complaint of deep pain in the left eye of three days' duration. The tension was found to be 35 mm. Hg (Schiotz). Tension in the right eye was 18 mm. Hg (Schiotz). Eserine and pilocarpine were used with only indifferent results. On February 24, 1936, the left eye was found to be stony hard and, after consultation, a wide basal iridectomy was performed. Since that time the tension has remained 20 mm. Hg (Schiotz). The patient was last seen in December, 1936, and was entirely comfortable.

Dr. Goldhammer reviewed the literature on nevus flammeus associated with glaucoma and mentioned several theories as to their association: (1) Branchial-cleft developmental defects with blocking of Schlemm's canal. (2) Sympathetic-vasomotor-nerve defects leading to dilatation of the blood vessels with a local increase of tension in the capillaries. (3) Iris changes blocking the angle.

Dr. Goldhammer advocated treatment with radium or the X ray and stressed the importance of explaining to the patient

the possibility of glaucoma and cerebral changes.

*Discussion.* Dr. Whitney Porter reported that in a series of 55 cases studied at Iowa University, all cases in which the nevus involved the eyelid showed glaucoma. The increase in tension usually appeared soon after birth or was present at birth. Microscopic sections showed no special pathology, mostly capillary dilatation and connective-tissue proliferation.

#### RECURRENT HEMORRHAGES INTO THE VITREOUS

DR. EDNA REYNOLDS presented Mr. J. H., aged 19 years, who entered Colorado General Hospital on April 29, 1936, with the complaint that there seemed to be smoke in front of his eyes and that in a bright light the smoke appeared red in color. The vision of the right eye was 20/25 and of the left eye 1/120. Examination of the fundus of the right eye showed congested, tortuous vessels with hemorrhages at the nasal side of the disc and in the macular region. The left eye showed a detached retina in the lower half of the globe with bands of retinitis proliferans.

The patient's grandfather had renal tuberculosis. The family came to Colorado from Minnesota in 1928 because of the father's poor health. No definite diagnosis of tuberculosis had been made.

The patient had been hurt in an automobile accident in October, 1935. One arm and several ribs were broken. He had been unconscious for a short time. No failure in vision had been noticed until two months after the accident. For the past two years he has had frequent, severe epistaxis. He has a poor appetite, is lethargic and depressed.

The physical examination was entirely negative except for infected tonsils. Blood pressure was 124/78. The Wassermann test was negative and repeated urinalyses were negative. Bleeding and co-

agulation time were normal. X-ray examinations of skull and orbit were negative and dental X-ray films showed no pathology. The blood chemistry was normal. An X-ray film of the chest showed marked fibrosis in the hili and bronchial system. A Mantoux test was reported negative with 1/10 mg. of O.T.

Because the largest number of recurrent hemorrhages into the vitreous in the literature have been ascribed to tuberculosis, the Mantoux tests were repeated on June 10, 1936. Intradermal tests were negative with dilutions of 1/100,000 and 1/10,000 O.T. but a positive skin reaction occurred with 1/1,000 O.T. and a focal reaction occurred in the left eye (a fresh hemorrhage accompanied by some pain).

On June 23, 1936, tuberculin therapy was instituted. The first dose given was 2 mm. of 1/10,000 B.E. The patient was advised as to the necessity for increased rest and food and heliotherapy was begun; 30 grains of calcium was prescribed daily. In July, 1936, a tonsillectomy was performed at Denver General Hospital. On August 24, 1936, four days after an injection of 0.9 c.c. of 1/10,000 B.E. another hemorrhage occurred in the left eye. The vision in the right eye continued to improve until October 10, 1936, when it was 20/15+. The tuberculin was continued at five-day intervals until a dosage of 1/10 mg. B.E. was reached on January 25, 1937. It was then discontinued. On February 3, 1937, hemorrhages occurred in the right eye and the vision was reduced to 20/80. On February 18, 1937, another hemorrhage occurred in the right eye at the extreme periphery. At the present time the vision of the right eye is 20/80 and there is only light perception in the left eye.

**Discussion.** Dr. Edward Jackson said that the lesions seen in the right fundus were suggestive of tuberculosis. No general cause for conditions of this type has been brought forward except tuberculosis.

Dr. F. R. Spencer said that the important things to remember about retinal hemorrhages are about as follows: (1) In older people with angiosclerosis hemorrhages are not uncommon. (2) The same may be expected from severe anemias and leukemias. Hemorrhages may complicate the mild types, but this is less likely. (3) The modern treatment for syphilis has greatly decreased the number of cases from this cause. (4) Tuberculosis is a frequent cause especially in young adults. (5) Nephritis (albuminuria) and diabetes often cause hemorrhages. Insulin prevents many of those caused by diabetes.

There are several important points about tuberculosis of the retina, as follows: (1) The patients are usually young adults without demonstrable clinical evidences of tuberculosis. They may have tuberculosis of lymph glands in the mediastinum with a rupture into a vessel and metastasis to the retina. (2) One eye is more often involved than the other, although he could recall several cases with involvement of both eyes. (3) Tuberculin therapy (T.R.) beginning with 1/10,000 mg. and repeated every four to six weeks is probably the best remedy. Two weeks should be a minimum interval between doses. A longer interval is better. (4) Focal reactions should be avoided because of the danger to vision and the future of the eye. Severe focal reactions may mean loss of an eye. (5) The treatment may have to be carried out over a period of one, two, or three years. (6) When he reported three cases in 1916 there were at least 32 authentic cases in the literature. There have been many more since.

Dr. W. H. Crisp expressed his doubts about the wisdom of tuberculin therapy in these cases. He said that he would like to see the results of careful tests for allergy.

Dr. W. M. Bane recommended the continued use of calcium.

Dr. D. H. O'Rourke said that he was

glad to see that the use of tuberculin is on the wane at present in this country.

Edna M. Reynolds,  
*Secretary.*

### SAINT LOUIS OPHTHALMIC SOCIETY

February 26, 1937

DR. CARL T. EBER, *president*

#### THE IMPORTANCE OF RHYTHM IN READING

DR. MAX JACOBS said that 8 to 15 percent of the school population is characterized by varying degrees of reading disability. In view of the fact that most tests of general intelligence require reading ability, children with severe reading disabilities have their academic powers underestimated. In handling poor readers we are concerned with (a) the correction of physical handicaps by a specialist, (b) the establishment of desirable attitudes towards reading, and (c) the development of efficient, rhythmical reading habits. Systematic left-to-right movements are characteristic of good readers.

Various methods have been used to measure eye movements, but the instrument with which corneal reflections from both eyes are photographed on the same film is the one discussed in this paper. With it we have an index to the coordinate functioning of the two eyes as well as a record of fixation-pause duration, fixation frequency, regressive movements, and return sweeps. If this record shows an elevation from the normal rhythm, exercises with the Metron-O-Scope may be of service. A number of patients have shown definite improvement in reading ability after exercising with this instrument for a month or two.

*Discussion.* Mr. E. A. Taylor (Bureau of Visual Science, American Optical Company) said that school failures, visual anomalies, and eye discomfort in

children are related to reading disabilities. Two groups of children were studied; one group consisted of failing students and the others were selected at random to represent normal. The normal children were more efficient in reading than the failing group. The reading ability was determined from eye-movement photographs. The findings from visual tests indicated a tendency in the normal children towards myopia, whereas the failing group showed a tendency towards hyperopia. The normal children had a lower degree of stereopsis than the ones failing in school. This difference was found to be remarkably reliable. The converging power of the eyes of the normal children was higher than that in the other group. The difference in near phoria between the two groups was not consistent. More cases of suppression of vision were found in the failing group than in the normal children. The number of students with eye discomfort was approximately equal for both groups. The study indicated the probability that visual anomalies which produce fusional disorders must influence reading ability. It was further determined from the experimental data that there seems to be a series of reading abilities which ranges from the poorest to the most efficient reader. It is known that a reader's place in this series is not determined primarily by intelligence, because children with a high I.Q. are not necessarily the most efficient readers. It was difficult to associate reading disabilities with eye dominance and handedness. Reversal tendencies and mirror reading were controlled by the Metron-O-Scope, which tends to prevent and eliminate these deficiencies. Many regressive movements made by the reader are merely corrective adjustments, due to inaccuracies in perception. Prism-reading training given with prisms in conjunction with the Metron-O-Scope tends to condition greater functional efficiency of the visual

mechanism and efficient reading habits, which the patient makes use of in his everyday reading. The most rapid reading ever recorded was 120 words a minute. The average first-grade student takes in four tenths of a word, whereas the college student takes in 1.25 words.

Dr. Guerdan Hardy said that reading difficulties in children have been studied more by psychologists than by ophthalmologists. Certainly most of the reports on diagnosis and treatment of such cases appearing in the literature during the past five years have been by psychologists.

Since the introduction of two new instruments by an optical company eye physicians are perhaps more conscious of such conditions. However, the care of such cases is certainly not so simple as the literature accompanying the machines would lead one to believe.

In the Eye Clinic Dr. William Meinberg has been making photographic records of the eye movements of children. Most of the patients have been sent from the Child Guidance Clinic. The majority of these were mentally retarded and the results were nil. It is technically difficult to secure good pictures. It also requires some mental process to get a good recording. No attempt has as yet been made to train any of these children.

He felt that it was difficult to separate pure reading difficulties from mental retardation, emotional disturbance, and speech and auditory imbalances. This requires study by a psychiatrist and psychologist. Also, the fundamental nature of the disability is still unknown. Psychologists admit that there is still considerable difference of opinion.

#### A SURGICAL OPHTHALMOSCOPE

DR. H. ROMMEL HILDRETH read a paper on this subject which was published in this Journal (1937, v. 20, June, p. 626).

#### SPONTANEOUS RUPTURE OF LENS CAPSULE IN HYPERMATURE CATARACT WITH SECONDARY GLAUCOMA

DR. H. C. KNAPP read a paper on this subject which was published in this Journal (1937, v. 20, August, p. 820).

*Discussion.* Dr. B. Y. Alvis said that he had had the opportunity of seeing two cases of this sort in which the hypermature cataract ruptured. The patients were seen early and they showed symptoms of acute glaucoma. In both cases the lens material was removed, satisfactory recovery followed, and good vision resulted. The difficulty in diagnosis comes about because one is apt to mistake the milky fluid in the anterior chamber and not the condition of acute glaucoma.

H. Rommel Hildreth,  
*Editor.*

#### LOS ANGELES SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

March 22, 1937

DR. WILLIAM A. BOYCE, *president*

#### SYMPOSIUM ON GLAUCOMA

DR. CARL FISHER opened the subject with a discussion of the clinical forms of glaucoma and the theory of the etiology of the several types. In addition to factors such as vascular changes, inflammatory products, and emotional upsets, he pointed out the importance of metabolic and biochemical alterations. The work of Otto Barkan, Troncoso, and Castroviejo, with particular reference to gonioscopic studies was emphasized.

DR. ALFRED ROBBINS discussed the pathology of glaucoma, also pointing out the significance of recent gonioscopic studies. These studies have revealed, in the simple form of glaucoma, deposits of pigment in the trabeculae of the anterior-chamber angle. These lesions have been

described by Barkan as clinging to the surface like barnacles on the hull of a ship. In some cases sclerosis can be observed. In another type of chronic glaucoma the iris-lens diaphragm advances to narrow the entrance to the angle and peripheral iris adhesions form which prevent outflow of the aqueous into Schlemm's canal.

DR. HAROLD WHALMAN described the visual fields in glaucoma. He pointed out the importance of ascertaining the visual field in making critical decisions in the management of glaucoma cases. He illustrated this point by describing two cases, one in a young woman with symptoms of ocular distress due to refractive error and hyperphoria. A glaucoma study was made on this patient and her intraocular tension was found to be 30 mm. Hg (Schiotz) in each eye. Her visual fields were found to be entirely normal. One year previous to this examination homatropine had been used in her eyes without any provocative effect. Glaucoma could not be proved in her case and she was considered to be nonglaucomatous in spite of her tension. The other patient was a young woman of 23 years who had the peculiar anatomical anomaly of cornea plana, symptoms of rainbows around lights on various occasions, and a definitely constricted visual field, but had an intraocular tension of only 26 mm. Hg (Schiotz) in each eye. Pilocarpine relieved her symptoms and her visual fields expanded out to the limits of normal and have remained so with moderate use of pilocarpine for a period of one year. Dr. Whalman described the development of Bjerrum scotoma, and mentioned the fact that it was frequently missed and that patients were often seen with greatly constricted fields after they had gone through the various stages of Bjerrum's sign,

Roenne's step, into the more advanced stages. He pointed out the importance of early surgical intervention when there was not prompt and continued response to medical treatment. In his opinion almost all cases of glaucoma eventually require surgery.

DR. RAY IRVINE discussed the usual medical treatment and advised the use of a solution of eserine, pilocarpine, and dionin in acute glaucoma. In addition he suggested the use of hypertonic solutions intravenously. In chronic glaucoma he emphasized particularly the search for constitutional causes and attention to foci of infection, as well as to diet.

DR. WILLIAM BOYCE described his methods of choice in the surgical management of glaucoma. In acute glaucoma he gives the patient sedatives, injects the lids and retrobulbar region with novocaine and adrenalin, and then performs an incision with a small Bard-Parker knife, making a conjunctival flap down to the limbus, and entering the anterior chamber by short strokes of the knife behind the limbus. One can get farther back to the root of the iris in this manner, which can not be accomplished with a keratome. For chronic simple glaucoma Dr. Boyce prefers the Elliot trephining operation, making a large flap after a subconjunctival injection. He dissects the flap and splits the cornea with a small Bard-Parker knife. In Dr. Boyce's opinion Dr. Barkan's microsurgery of the angle has only a limited application, being restricted to those cases of sufficient anterior-chamber depth. The extreme minuteness and delicacy of the technique would be a deterrent to many eye surgeons.

Harold F. Whalman,  
*Editor.*

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## MEDIEVAL OPHTHALMOLOGY

The history of medicine has been explored very abundantly, thanks to ancient manuscripts and the legacies of the printing press. Most research on the subject has naturally been accomplished in Europe rather than in this country, but a goodly number of medical men in the United States have rendered excellent service either in research or in collating earlier and scattered essays for the use of their American colleagues.

Professor Ralph H. Major of the University of Kansas, who is well known for the interest he has displayed in medical history, is the author of a book entitled "Disease and Destiny"; and this work has lately been published in German translation. Strebel of Lucerne, himself a prolific writer on the history of ophthalmol-

ogy, makes this translation the occasion for recital of some details of medieval ophthalmology as illustrated in the life of Saint Francis of Assisi (1182 to 1226), founder of the mendicant order known as the Franciscans, and from whom our own city of San Francisco takes its name (Klin. M. f. Augenh., 1937, volume 99, page 252).

Saint Francis began his career as the son of a rich merchant of the ancient Italian city of Assisi, high up in the Apennines. Although frail from childhood he is recorded to have been spendthrift alike of health and of his father's fortune, a leader of nightly revels among his boon companions. (A statement in one of the encyclopedias, by a member of the Society of Jesus, to the effect that "As a youth he was remarkable for his ardent piety and

the spotless purity of his life," seems less valid.) He took part in a petty war between his own city and Perugia; was kept for a year in a dungeon as a prisoner of war; and, although having suffered greatly in health during his incarceration, and having at the same time felt some stirrings of religion, again he led the night parties of friends, spending wildly (the pious admirer mentioned above says in "repairing dilapidated churches"); and again he went to war, this time in the army of the Pope.

His religious fervor now reached the point of changing his whole existence. He dressed in rough cloth and traveled as a beggar. He was disowned by his father. He experienced spiritual ecstasies, inflicted upon himself all sorts of physical hardships, went preaching from place to place. In one of his religious ecstasies, on Mount Alveno, he is said to have acquired the stigmata—bleeding wounds on hands, feet, and side corresponding to Christ's wounds upon the cross.

The organization of his mendicant order, at first opposed but finally accepted by the church, was followed by years of wandering and preaching, even as far as Egypt. He became regarded as a saint, a worker of innumerable miracles. His death in 1226, at the age of forty-five years, was the culmination of a long period of ascetic devotions and progressive ill health, including a succession of hemorrhages, abdominal disorders, and circulatory disturbances with edema of the thighs and legs. At his own request, he died on the bare earth.

For two years before his death he was completely blind. Major and Strebel agree that the cause of his blindness was a tuberculous uveitis. The eye specialists whom he consulted at Rieti in 1224, failing to obtain any improvement of the eye condition, took Saint Francis to a colleague in Sienna. The physician rode a

horse, the patient traveled on a donkey. On the way, both experienced the vision of the three women which is well known in the history of art.

Curious, sometimes amusing, occasionally repulsive to modern medical thought is the list of remedies applied to the emaciated patient by the eye physician and his consultants. Correct diagnosis was impossible. Chiefly resorted to were purgatives, blood-letting, ointments, herbs, and the spectacular cauterization of the patient's forehead. This last, we are told, was not an invention peculiar to the surgical torture chamber of the middle ages, but had been derived from remote antiquity. It is still used in the South Sea Islands, especially upon the newborn as a prophylactic against cataract. It is suggested that the use of this procedure points, as regards Saint Francis, to complications in the form of secondary glaucoma and cataract. In this barbarous treatment, greatly resorted to for many purposes, the cauterizing iron was laid in the fire until it glowed, then the flesh was seared from ear to eyebrow on each side.

The pharmacopœia of Galen's "Ophthalmology," burned by Paracelsus in the market at Basel in 1527, also included the bile of all sorts of animals, the bile of the eagle and of certain snakes being recommended by Pliny in the first century A.D.; saliva (used locally); mother's milk as a collyrium (still used at the present time in some parts of the world); and vipers roasted alive, highly praised by Galen, particularly for cataract. It is interesting to know that in recent years much has been written as to the benefits of bee sting or snake venom, in certain eye conditions, especially "rheumatic" iritis and dendritic herpes; and Strebel notes that there is a chemical relationship, or even identity, between bee and snake poisons.

To cover the wounds of cauterization, Saint Francis wore a cap of sackcloth,

instead of the headdress of woolen felt customary for the purpose. As death approached he said to the doctor: "Brother Physician: announce to me the coming of death, it will be a doorway to life." To Death himself he said: "Welcome Brother Death." As brothers and sisters he regarded not only all creatures but every created thing.

In every period, the intelligence of man has sought explanation of natural phenomena, including illnesses; and in all ages ignorance of cause, with impossibility of diagnosis, has favored resort to a great variety of forms of treatment, often without physical benefit to the patient. In this group frequently belonged and still sometimes belong various "shotgun" prescriptions. Here and there some good came out of this empiric groping. As to a number of diseases we are still almost as ignorant as were our forefathers; and it may be that to our remote descendants some of the remedies we still employ will appear as blind and as ridiculous as appear to us in the present the therapeutic procedures of bygone ages.

W. H. Crisp.

#### VISUAL STANDARDS FOR LICENSURE TO OPERATE MOTOR VEHICLES

Among ophthalmological subjects that have been of outstanding interest to the public in the past few years are orthoptics, usually introduced by the patient's query, "Would exercises help my eyes, doctor?"; the problem of the backward child at school who does most of his work well except for reading; contact glasses, the thought of which has been popularized by repeated articles in the lay press; lighting standards for the home, the office and the highway; and visual standards for various occupations, especially for the licensure of aviators and automobile drivers.

Considering the last of these only, we are confronted by questions which seem relatively simple until they are analyzed and the attempt is made to draw up suitable laws. The vital importance of this matter is obvious when one considers the death toll from automobiles on the open roads and on city streets, the thousands killed and tens of thousands injured. The question naturally arises as to how important is poor sight in this tragedy.

There are so many factors in safe driving, such as intelligence, physical efficiency in general, attention, good judgment, lights and lighting, speed laws, road construction, and automobile and tire condition, that to separate for accurate analysis and evaluation one individual factor such as vision is obviously impossible. The best that can be done is to study the important related elements of vision and to make as good an estimate as possible. This is a rather hit-or-miss method on which to base legislation, but nothing better offers.

At once occurs to the student the problems of visual acuity, field of vision, absence of diplopia, and light and dark adaptation. Other factors which may play a more important part than that now assigned to them, judging by the not infrequent complaints of patients, are inability to evaluate distances from moving objects or to estimate their rate of motion.

That some sort of visual tests of individuals should be made is generally agreed, and where they are not carried out undesirability is never given as a reason, but always the excuse of impracticability. That tests of all of the possible accident-producing visual factors cannot practically be made is obvious. Which ones are vital and should first be determined? and then how defective can these be and still permit licensure?

The consideration that upsets all mechanical methods of calculation is the response of the individual to his handicap.

A person conscious of his defect will exercise unusual care. One woman who has retinitis pigmentosa with a visual field within the 20-degree circle in each eye, vision of twenty fortieths in the better eye, and with the added disability usual in subdued light in this disease, drove an automobile without mishap for ten years in one of our largest cities. We have strict rules regarding stereopsis at twenty feet for our aviators and yet one of the world's most famous aviators, who circled the globe in record time, had but one eye!

Nevertheless, one must lay down some rules even if only as a starting point. Visual acuity is surely the most important ocular requirement. Second to this in importance would undoubtedly be the visual field, but to test this is difficult and exceedingly time consuming. It could hardly be included as a universal requirement, but might be considered secondarily in cases in which vision seemed to be responsible for an accident.

In 1925 a report by a special committee on visual standards for operating motor vehicles was submitted to the Section on Ophthalmology and approved by the House of Delegates of the American Medical Association. These were modified somewhat and a report made in 1937 (see the *Journal of the American Medical Association*, 1937, volume 109, Oct. 16, page 61B). Sections 5, 6, and 7 have to do with the visual portion of these standards. Important provisions follow:

"When applicants are discovered with defects of vision which fall below the standards set for an unlimited license, such applicants shall be referred to an eye physician for correction of any possible defects. (The major portion of such defects are correctable). . . .

6. Minimum Visual Standards for License: For an unlimited license, provided that physical, mental and aptitude tests are satisfactory, an applicant shall

meet the following minimum visual standards:

(a) Visual acuity with or without glasses of 20/40 Sn. in one eye and 20/100 Sn. in the other.

(b) A field of vision of not less than 45 degrees to both sides laterally from point of fixation.

(c) Binocular single vision.

(d) Ability to distinguish red, green and yellow. Glasses, when required, must be worn while driving, and those employed in public transportation shall carry an extra pair.

7. Visual Standards for Limited License: A limited or restricted license may be issued to applicants who are unable to meet the visual standards set for unlimited license. The minimum requirements for this shall be:

(a) Visual acuity shall be not less than 20/65 Sn. in the better eye. (The one eyed, the aphakic and the color blind are not disqualified.)

(b) Field of vision shall be not less than 125 degrees horizontally in one eye.

(c) Diplopia shall not be present."

These recommendations should be carefully studied by ophthalmologists so that they may be prepared to offer criticisms or suggestions when the subject is brought up for final action.

Lawrence T. Post.

## BOOK NOTICES

### EYESTRAIN AND CONVERGENCE.

By N. A. Stutterheim, M.D. Cloth-bound, 99 pages, 2 illustrations. London, H. K. Lewis and Co., Ltd. 1937. Price 7 shillings 6 pence.

Since the publication of Donders's "Accommodation and refraction of the eye," the associated symptoms, designated by Weir Mitchell as eyestrain, have been ascribed to strain of accommodation.

Stutterheim connects them with strain of convergence; astheno-convergence he calls it. He quotes Parsons, "The exact pathology of eyestrain is unknown," and urges views in the following summary which he publishes in French, German, Italian, and Spanish, as well as in English.

Summary: "The actual primary position of the human eyes is not one of parallelism, but of divergence. This primary position is firmly fixed, and possesses positional stability and perfect elasticity. The intrinsic eye muscles act as tensors, and not antagonistically. My conception of convergence is that it represents an autonomic power of the mind (or brain); it manifests itself as the basic movement of the dual eye, and forms the kinetic principle of bifoveal single vision. This convergence acts by visual reflexes only, and not through volition, nor with the assistance of consciousness. During vision this convergence keeps the convergence muscles in constant action—viz., the *musculi recti interni, superiores* and *inferiores*, and the *musculi obliqui*. The *musculi recti externi* do not belong to the group of convergence muscles—i.e., convergence is independent of the action of those muscles. Convergence acts as much through inhibition of its muscles as through their contraction. The full unfolding of the power of convergence is indispensable for man's visual efficiency in modern civilization. When the power of convergence is not fully unfolded there is eyestrain. Eyestrain is curable by kinetic treatment. This treatment is designed to unfold the power of convergence."

Stutterheim has previously written on this subject. His bibliography of nineteen references includes five of his own papers, *British Journal of Ophthalmology* (four) and *Lancet*. He reviews the physiology of related brain centers and quotes supporting statements, especially by Sherrington.

His diagnosis is based on testing the convergence power, or balance of the lateral muscles at 5 or 6 meters. The essential part of his treatment is with batteries of prisms, having increasing strengths of one degree for lateral, and one-fourth degree for vertical movements. His views are supported by a table of one hundred cases, with the addition of nineteen "typical cases," given in detail.

This book forces upon our attention neurologic aspects of muscle imbalance that have been generally neglected in the literature relating to this subject. By compelling new studies of this somewhat obscure pathologic condition, it may be of important benefit.

Edward Jackson.

#### CONFÉRENCES OPHTHALMOLOGIQUES (Lectures on ophthalmology).

By H. Arruga. Paper cover, 162 pages, many illustrations in the text. Lausanne (Switzerland), Imprimeries Réunies S.A., 1937. Price not given.

As stated on the title page, these lectures were given in various universities and before various scientific societies in Argentina, Uruguay, Brazil, Puerto Rico, Venezuela, the United States of America, Holland, and Switzerland. The lectures are printed in the French language.

A two-page facsimile letter (in French) in the author's handwriting follows the title page. It expresses eloquently the author's appreciation of the many generous letters which poured in from colleagues all over the world from the day when, shortly after the outbreak of the Spanish civil war, Arruga found himself on French soil. This little volume is dedicated "to those to whom I feel myself, with infinite gratitude, under obligation."

Most of the numerous elegant and entirely practical illustrations in the volume

have been taken from works previously published by the author.

The three leading essays deal with complete extraction of cataract, the surgical treatment of lacrimation, and the surgical treatment of retinal detachment. The eight other papers are concerned with eye diseases due to hepatic insufficiency and allergy, a suction apparatus for cataract extraction, focal affections in ophthalmology, some details of work in ophthalmologic clinics, operation for ptosis, the present condition of problems regarding glaucoma, plastic operations in ophthalmology, and relations between ophthalmology and general medicine.

The author's work on intracapsular extraction is well known. He emphasizes the extent to which improvements in anesthesia have rendered possible maneuvers which would formerly have been dangerous. "The cataract operation had for most ophthalmologists the character of a little drama . . . from the moment of completing the corneal section to the moment when the sutures were tied . . . for fear of operative complications, especially loss of vitreous. . . . This character . . . has been lost in large part thanks to the perfecting of anesthesia."

In the lacrimal operation the author's special drills, operated through a dental cable, are featured. The steps of the operation are copiously illustrated. After operation for retinal detachment, Aruga insists on the importance of not uncovering the unoperated eye too soon.

"Stenopeic spectacles greatly limit ocular movements; but a binocular dressing is much more effective."

W. H. Crisp.

## OBITUARIES

### SOREN HOLTH

1863-1937

Dr. Soren Holth was born in Naes, Romerike, Norway, July 21, 1863. He died suddenly following a stroke of apoplexy in Oslo, on September 23, 1937, at the age of 74 years. Two years prior to his death he had retired from active practice as an ophthalmologist.

Dr. Holth had practiced his specialty in Drammen, Norway, from 1891 to 1895. From September, 1895, to October, 1896, he furthered his studies in ophthalmology in the clinic of Professor Julius Hirschberg of Berlin; in the clinic of Marius Tscherning of Paris; and in the clinic of Carlo de Vincentiis of Naples. He later did work in many foreign clinics. Upon many occasions he lectured in Oxford, Helsingfors, Stockholm, Budapest, and other places. His name will long be remembered for his excellent work and studies on glaucoma ("Iridencleisis cum iridotomia meridionalis").

Dr. Holth was gracious and sympathetic; he will be long and kindly remembered by those privileged to know him. His life was an inspiration and a challenge.

John Holst, M.D.

# ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

## CLASSIFICATION

- |  |  |
|--|--|
| 1. General methods of diagnosis                        | 10. Retina and vitreous                                |
| 2. Therapeutics and operations                         | 11. Optic nerve and toxic amblyopias                   |
| 3. Physiologic optics, refraction, and color vision    | 12. Visual tracts and centers                          |
| 4. Ocular movements                                    | 13. Eyeball and orbit                                  |
| 5. Conjunctiva   | 14. Eyelids and lacrimal apparatus                     |
| 6. Cornea and sclera                                   | 15. Tumors   |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries   |
| 8. Glaucoma and ocular tension                         | 17. Systemic diseases and parasites                    |
| 9. Crystalline lens                                    | 18. Hygiene, sociology, education, and history         |
|  | 19. Anatomy, embryology, and comparative ophthalmology |

### 7

#### UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Samuels, Bernard. **Glaucoma and sympathetic ophthalmia.** Arch. of Ophth., 1937, v. 17, June, p. 1031. (See Section 8, Glaucoma and ocular tension.)

Souza Queiroz, Leoncio de. **Two cases of intraocular ossification.** Arquivos do Inst. Penido Burnier (Brazil), 1937, v. 4, June, pp. 354-358.

Both cases were diagnosed by roentgenography and confirmed by histologic examination. The first patient had microphthalmos and cataract, the second had an atrophic eyeball with pupillary occlusion and seclusion. In the former case the atrophy was in the choroid and vitreous, in the latter it was in the choroid and retina. (6 illustrations, including 2 roentgenograms and 2 photomicrographs.)

W. H. Crisp.

Uchida, Yuzo. **The passage of vitamin C into the aqueous humor of the rabbit eye. Study 1. Experiments in instillation of vitamin C.** Folia Ophth. Orientalia, 1937, v. 2, Feb., p. 283.

The amount of vitamin C in the aqueous humor remained unaltered after a solution devoid of vitamin C was instilled into the rabbit eye continuously over a long period of time. If, however, vitamin C was added to the solution the amount of vitamin C in the aqueous increased, proving that the cornea possesses a selective absorptive capacity for vitamin C. It took a considerably longer time for the vitamin C thus increased to disappear from the anterior chamber than it took for it to enter. That the increase of vitamin C was not due to lowering of the blood-aqueous barrier was proved by the findings that although the protein content of the aqueous humor increased to some extent after continuous instillation of neutralized "garden juice" (containing from 10.2 to 16.6 mg. vitamin C per 100 c.c.) it did not increase proportionally to the increase of vitamin C in the aqueous.

R. Grunfeld.

Wescamp, C., and Adrogué, E. **Subchronic uveoparotitis (Heerfordt).** Arch. de Oft. de Buenos Aires, 1937, v. 12, June, p. 319.

The case reported was observed in a

male of 37 years in whom it first appeared at the age of thirty with a right-sided orchitis and parotitis lasting for three weeks. After a remission of about a year, the patient has been subject to severe occipital headaches accompanied by pain in the right parotid and incited by loud noises, prone position, and concentration of attention. Simultaneously with the first onset of the headaches, there began a deterioration of vision, leading to amaurosis of the right eye, followed one year later by concentric contraction of the visual field of the left eye to between ten and fifteen degrees. The fundus of the right eye presents a picture described as a "proliferating chorioretinitis probably secondary to exudative chorioretinitis." The left eye showed only discrete pigment disturbances in the periphery. The annular scotoma suggested that of retinitis pigmentosa. Pressure on the parotid, and mastication, diminish the pain. Some disturbance of equilibrium has been noted of late. The writer doubts the tuberculous origin of the affection and is inclined to the hypothesis of a virus infection.

M. Davidson.

## 8

### GLAUCOMA AND OCULAR TENSION

Barkan, Otto. **The structure and functions of the angle of the anterior chamber and Schlemm's canal.** Trans. Western Soc., 1935, 2nd mtg., pp. 82-89. (See Amer. Jour. Ophth., 1936, v. 19, June, p. 540.)

Bednarski, A. **Glaucoma and its treatment.** Klinika Oczna, 1937, v. 15, pts. 2-3, p. 129.

A review of the literature.

Bothman, Louis. **Repair of choroidal detachment.** Arch. of Ophth., 1937, v. 18, July, pp. 65-67.

A case is reported in which cho-

roidal detachment associated with low tension and constricted fields had persisted for eight months following an Elliot trephine operation. A piece of tendon from the superior rectus muscle was transplanted over the trephine opening, and seven weeks later the choroidal detachment had disappeared and the field was normal.

J. Hewitt Judd.

Denig, Rudolf. **Iridotorsion in comparison with trephining, Lagrange's operation, and cyclodialysis.** Klin. M. f. Augenh., 1937, v. 99, July, p. 1.

Iridotorsion consists, as Denig reported in 1930, of a modified Lagrange sclerectomy with lining of the opening by the protruded truncated temporal part of the iris. Compared with an oil lamp, Lagrange's sclerectomy and trephining create only the neck of the lamp, whereas iridotorsion adds the wick necessary for filtration of the oil. Extraocular, and wound around a fine dentist's probe, it forms a spongelike cushion, creating not an open fistula but a filtration through the iris wick. The technique is described in detail with mention of possible accidents during the operation. A résumé of 154 operations shows great efficacy. With no other method, 94.7 percent showed relief of tension. Accidents to ciliary body, vitreous, and lens were eliminated, and by the lining of the scleral opening with iris tissue the frequency and danger of late infection were very much diminished. (Illustration.)

C. Zimmermann.

Dyar, E. W., and Matthew, W. B. **Use of sucrose preparatory to surgical treatment of glaucoma.** Arch. of Ophth., 1937, v. 18, July, pp. 57-61.

Five cases are reported from a series of twenty observed, in which intra-

venous use of sucrose prior to operation reduced the intraocular tension to a relatively constant reading of 12 to 22 (Schiötz) regardless of its height before the injection. As a routine, 400 c.c. of a 25-percent solution is injected slowly into the vein in the course of 45 to 60 minutes. There is no contraindication to its use in diabetes, since sucrose is not absorbed by any tissue of the body but is excreted wholly by the kidneys. The only contraindication is a markedly low renal function.

J. Hewitt Judd.

Friedenwald, J. S. **Contribution to the theory and practice of tonometry.** Amer. Jour. Ophth., 1937, v. 20, Oct., pp. 985-1024.

Günther, Rosemarie. **The significance of malformations of the iris in the origin of primary glaucoma.** Klin. M. f. Augenh., 1937, v. 99, July, p. 92.

To explain these processes attention is called to the embryonic connections between the mesodermal part of the iris and the angle of the anterior chamber. Disturbance of development or function of one structure may influence the other. On account of the appreciable number of cases in which a malformation of the iris is responsible for the occurrence of glaucoma, constant control of intraocular tension seems important.

C. Zimmermann.

Hicks, A. M. **A stable nonirritating solution of physostigmine salicylate.** Amer. Jour. Ophth., 1937, v. 20, Oct., pp. 1040-1041; also Trans. Pacific Coast Oto-Ophth. Soc., 1937, 25th mtg.

Lagrange, Henri. **The surgical treatment of chronic glaucomatous ocular hypertension.** Brit. Jour. Ophth., 1937, v. 21, Sept., pp. 477-495.

Under the headings of definition,

pathogeny, and treatment together with results, the author compares the principles of a surgical method established in 1905 by Félix Lagrange with the present technique. It is declared that all the essentials of the earlier findings are continued through and included with the present technique, with the soundness of the method well established after being in continuous use for 33 years. Methods of procedure are given in detail. (12 figures, references.)

D. F. Harbridge.

Lauber, Jan. **Treatment of glaucoma.** Klinica Oczna, 1937, v. 15, pts. 2-3, p. 144.

Visual acuity, visual fields, and tension should be checked at least every two months, even after a successful operation. Miotic treatment is justified only as long as no further deterioration of vision takes place. Constitutional treatment is important, reduction in general blood pressure harmful. Operation on both eyes at one time is to be avoided. In chronic and simple glaucoma cyclodialysis is the operation of choice. When malignant glaucoma is feared a posterior sclerotomy should be performed at the same sitting. The presence of malignant glaucoma calls for posterior sclerotomy, aspiration of vitreous or extraction of the lens.

Ray K. Daily.

Malbran, J. **Fuchs's epithelial dystrophy and capsular glaucoma.** Arch. de Oft. de Buenos Aires, 1937, v. 12, July, p. 441. (See Section 6, Cornea and sclera.)

Massoud, Farid. **Extraocular influence in glaucoma.** Brit. Jour. Ophth., 1937, v. 21, Oct., pp. 559-564.

By analyzing the pathologic changes in the circulatory, nervous, and endocrine systems, the author demonstrates

the presence of a toxin or toxins in the body in cases of glaucoma. Proper understanding of these extraocular influences indicates the proper line of treatment. Proper elimination, rest in bed, directed diet, intravenous injections, irradiation, and insulin are among the treatments suggested. The author suggests the possibility of treating and preventing conditions of primary glaucoma in the early stages on dietetic lines and on the basis of biochemistry and bacteriology. (References.)

D. F. Harbridge.

Mehney, G. H. **Nevus flammeus associated with glaucoma.** Arch. of Ophth., 1937, v. 17, June, pp. 1018-1023.

The glaucoma in this condition is thought to be due to a choroidal angioma, or to an obstruction of the filtration angle, or, in some cases, to a plasmoid aqueous caused by increased capillary permeability. The case reported is that of a man, aged 26 years, with a nevus involving nearly the whole face and a bilateral glaucoma. External examination was negative except that the conjunctival vessels were dilated and tortuous. In each fundus there was a glaucomatous cupping of the disc and the retinal veins presented marked tortuosity and anomalous intercommunications. No hemangioma of the choroid was seen. A corneoscleral trephining was followed by complete retinal detachment thought to be caused by a choroidal hemorrhage. Two diathermy operations were unsuccessful. (Photograph, fundus drawing, perimetric chart.)

J. Hewitt Judd.

Paas, W. L. **Bilateral glaucoma with leontiasis ossea.** Zeit. f. Augenh., 1937, v. 92, July, p. 221.

Leontiasis ossea is a rare deformity of the face resulting from diffuse hyper-

ostosis of the bones of the face and head. Only the young are afflicted and the etiology is unknown. The malady should be distinguished from Paget's osteitis deformans, Recklinghausen's osteitis fibrosa, and symmetric hyperostoses of the jaw. The ocular complications which have been observed are exophthalmos, myopia, papilledema, optic atrophy, and thickening of the sclera.

In the author's patient, a woman of 48 years, the disease started after a nasal operation in 1899. Tremendous growth of the bones of the face and jaw deformed the head so that she no longer left her room. Recently glaucoma developed. An Elliot trephining saved the one eye that still had vision at the time she presented herself.

F. Herbert Haessler.

Roberts, W. H. **Acute glaucoma secondary to relapsing fever followed by uveitis.** Trans. Western Ophth. Soc., 1935, 2nd mtg., pp. 52-54. (See Amer. Jour. Ophth., 1936, v. 19, Jan., p. 43.)

Samuels, Bernard. **Glaucoma and sympathetic ophthalmia.** Arch. of Ophth., 1937, v. 17, June, pp. 1031-1039.

Glaucoma in both the exciting and the sympathizing eye is considered in its relationship to sympathetic ophthalmia. The surgical procedures for reduction of the tension in the sympathizing eye are discussed. Sympathetic ophthalmia may develop in four types of eyes; those with decreased tension, with normal tension, with primary glaucoma and with secondary glaucoma. In a histologic survey of 112 eyes that had excited sympathetic ophthalmia, thirteen were found in which there had been glaucoma previously. These thirteen are briefly reported in two groups. The first group was composed of eyes with primary glaucoma which excited

sympathetic ophthalmia after operation for high tension. In five of the six cases, the sympathetic ophthalmia developed at a time when the eye had become soft. In one it developed while the tension was high, and this was the only eye that failed to reveal the typical specific infiltration. The second group included those eyes with secondary glaucoma which after injury or operation excited sympathetic ophthalmia. In six cases there was very little specific infiltration and in one there was none. In one the eye was softened by a vitreous abscess and this showed heavy specific infiltration. These histologic findings support the clinical observation that when the preexisting tension in the exciting eye is high the inflammation in the fellow eye is more apt to run a mild course than if it had been excited by a soft, atrophic eye.

J. Hewitt Judd.

Vogt, Alfred. **Results of diathermic acupuncture of the ciliary body for glaucoma.** *Klin. M. f. Augenh.*, 1937, v. 99, July, p. 9.

On account of its possible complications (opacities and ulcers of the cornea, iritis with synechiae, opacities of the aqueous and lens, hemorrhages into the anterior chamber), it must be ranked behind the operations aiming to promote the outflow of aqueous, especially trephining and iridencleisis. But it is indicated in cases of persistent hypertension with abolition of the anterior chamber. It not only reduces the tension to its lowest point and relieves the consequent anemia of the retina, but it also restores the anterior chamber. Two cases (one aphakic) illustrate the remarkable results. Explanation of its effect may be sought in the ideas that the physiologic production of aqueous is perhaps too great for a glau-

comatous eye, and that damage to the ciliary body by the operation may diminish secretion of aqueous.

C. Zimmermann.

## 9

### CRYSTALLINE LENS

Bellows, J. G., and Rosner, L. **Studies on galactose cataract.** *Amer. Jour. Ophth.*, 1937, v. 20, Nov., pp. 1109-1114.

Bothman, Louis. **Repair of rupture of the wound after extraction of cataract.** *Arch. of Ophth.*, 1937, v. 17, June, pp. 1073-1075.

Two cases are reported in which repair of the rupture of the wound was done to prevent the formation of the corneal opacity caused by the horizontal groove, and to reduce or prevent high astigmatism. A Van Lint conjunctival flap was prepared, the lip of the wound separated by a spatula, the corneal section enlarged for from 1 to 1.5 mm. below the horizontal groove, the prolapsed portion of the iris replaced or excised, and any hematoma removed. The cornea was then stroked into the proper position and held while the conjunctival flap was pulled down from above and the sutures tied.

J. Hewitt Judd.

Boyce, W. A. **Motion picture demonstration of the Elschmig technique of intracapsular cataract extraction.** *Trans. Western Ophth. Soc.*, 1936, 3rd mtg., pp. 179-181.

The author outlines the technique of cataract extraction by the method of Elschmig. Of 170 cataracts extracted by the Elschmig technique, 65 percent have been intracapsular and the rest extracapsular.

George N. Hosford.

Churgina, E. A. **The effect of vitreous changes on the results of intra-**

**capsular cataract extraction.** Viestnik Opht., 1937, v. 10, pt. 5, p. 653.

A report of a study of 75 cataract extractions, in which 18 percent had loss of vitreous. The author concludes that the technique of intracapsular extraction is conducive to vitreous prolapse; that complicated hernia of the vitreous may occur during the extraction or at a later date; that pigment in the vitreous, cellular elements, and subsequent thickening of the limiting membrane are caused by irritation of the ciliary body and a low grade cyclitis; and that loss of vitreous and vitreous hernia predispose to immediate or late retinal detachment. Ray K. Daily.

Churgina, E. A., and Dimitrieva, A. A. **The significance of atrophic changes in the iris in intracapsular cataract extraction.** Viestnik Opht., 1937, v. 10, pt. 5, p. 648.

Study of 75 cases leads the author to conclude that rupture of the lens capsule during intracapsular extraction is due not to friability of the lens capsule, but to resistance by the zonule of Zinn. In eyes with pronounced atrophic changes in the iris, the connection between the lens capsule and the zonule of Zinn is loose and the capsule rarely breaks. The opposite is true in cases without changes in the iris; and such cases are also prone to develop postoperative cyclitis, because of traction through the zonule of Zinn on the ciliary body. Ray K. Daily.

Cowan, A., and Fry, W. E. **Secondary cataract; with particular reference to transparent globular bodies.** Arch. of Opht., 1937, v. 18, July, pp. 12-22. (See Amer. Jour. Opht., 1937, v. 20, Sept., p. 962.)

Fabozzi, Mario. **Hypophyseal infantilism and hard capsulo-lenticular**

**cataract.** Boll. d'Ocul., 1937, v. 16, March, pp. 299-414.

A youth of nineteen years showed the somatic development of a boy of ten years. He had marked reduction of vision due to bilateral cataract, which under biomicroscopy and histologically appeared to be a hard cataract differing from the typical endocrine cataract. It had to be considered, however, as due to the general disease. (Bibliography, 4 figures.) M. Lombardo.

Federici, E. **The pathogenesis of post-operative delirium.** Boll. d'Ocul., 1937, v. 16, March, pp. 249-262.

A man of 70 and a woman of 65 years treated with instillations of one-percent solution of atropin after cataract extraction became delirious, one ten days and the other three days after use of the drug. The delirium disappeared when atropin was discontinued, but reappeared if it was used again. A man of 76 and a woman of 75 years who had been operated on for cataract extraction, and a man of 80 years operated on for glaucoma simplex, showed symptoms of postoperative delirium when atropin was replaced by scopolamin 0.25 percent. These three patients were affected by general arteriosclerosis. The delirium disappeared when the scopolamin was discontinued. The article is closed with a discussion of postoperative delirium from various causes. (Bibliography.) M. Lombardo.

Fiore, Tito. **Blood sulphur and glutathionemia in cataract patients.** Boll. d'Ocul., 1937, v. 16, March, pp. 327-338.

The serum obtained from 15 c.c. of blood was used for determination of the sulphur and 5 c.c. of the entire blood for the determination of glutathione. The tests were made on five normal pa-

tients used as controls, and on fifteen patients aged from 40 to 55 years who were affected by a rapidly developing cortical cataract. The following conclusions were reached. The blood glutathione and sulphur are increased in cataract patients. The increase of total sulphur may indicate that in cataract patients there is a slowing of organic oxidation which may correspond to slowing of the nutritive processes of the lens. The increase in glutathionemia may represent the effort of the patient's system to be compensated for the damage it sustains by lessening of cellular oxidation. (Bibliography.)

M. Lombardo.

Friede, Reinhard. **Removal of soft cataracts and cortical remains by suction; use of same instrument in hyphema, hypopyon, and keratoplasty.** Zeit. f. Augenh., 1937, v. 92, July, p. 201.

For all the situations mentioned in the title, the author urges the use of suction applied by mouth with the help of a Poulard tube. The rubber tube has a glass tube inserted near the canula for better control. The author has distinctly less after cataract since thoroughly removing all débris from the anterior chamber by suction. This cannot be accomplished with a spoon and he deprecates the use of irrigation. In performing keratoplasty, he keeps the field free from any blood and exudate which might facilitate development of cicatricial membranes.

F. Herbert Haessler.

Jacobs, Irving. **Spherophakia, luxation of lenses, and secondary glaucoma relieved by extraction of lenses.** Amer. Jour. Ophth., 1937, v. 20, Oct., pp. 1042-1044.

Kaminskaja, Z. A. **Formation of spaces in the lens.** Viestnik Opht., 1937, v. 10, pt. 5, p. 675.

A report of a case of this rare occurrence. Each lens of the patient, nineteen years of age, had a space filled with transparent fluid completely occupying the embryonic nucleus. Another space occupied the anterior cortex. The author attributes the anomaly to an intra-uterine disturbance causing insufficient growth of the cells filling in the embryonic lenticular sac. Ray K. Daily.

Karsch, Johannes. **Clinical and biological considerations of congenital cataract, particularly lamellar cataract.** Zeit. f. Augenh., 1937, v. 92, Aug., p. 322.

On the basis of statistical study of fifty patients who could be reexamined after treatment for congenital cataract, the author discusses the factors to be considered in making various forms of cataract reportable and in deciding in which types it should be recommended that the individual be sterilized.

F. Herbert Haessler.

Knapp, Paul. **The question of operation for secondary cataract.** Klin. M. f. Augenh., 1937, v. 99, July, p. 15.

Knapp has not adopted intracapsular extraction. In his opinion technique and after treatment of extracapsular extraction are most important for a successful operation on secondary cataract. He discusses this in detail, with the conclusion that operation for secondary cataract is without danger in the great majority, provided the eye is free from irritation and cortical remnants have been absorbed. Early discission is preferable if the posterior capsule is still tender and elastic. The author cuts the capsule from behind. The only real danger is glaucoma, so that pilocarpin

is instilled after operation. The supposition seems justified that by injuring the limiting membrane of the vitreous in such cases obstruction of the efferent paths by vitreous tissue in the anterior chamber may be the cause of increased tension. If there is a predisposition to glaucoma, reserve as to operation on secondary cataract is recommended.

C. Zimmermann.

Lagrange, Henri. **Pneumatic extraction of the lens by zonular rupture.** *Ann. d'Ocul.*, 1937, v. 174, June, pp. 387-393.

A procedure for intracapsular cataract extraction by means of a pneumatic cup is described. Anesthesia is obtained by using 5 percent cocaine and 1 to 1000 epinephrin alternately every two minutes for forty minutes. Palpebral akinesia is employed. After a peripheral iridectomy the anterior capsule is grasped with the suction tip, using a reduced pressure between 60 and 65 mm. of mercury. The inferior zonule is broken by a rocking motion and the lens is removed by tumbling. (12 illustrations.) John C. Long.

Lijo Pavia, J. **Senile cataract, a new medical treatment.** *Klin. M. f. Augenh.*, 1937, v. 99, Sept., p. 292; also *Rev. Oto-Neuro-Oft.*, 1937, v. 12, July, p. 182. (See *Amer. Jour. Ophth.*, 1937, v. 20, July, p. 757.)

Lüderitz, Bernhard. **Incineration of sections of the normal lens.** *Klin. M. f. Augenh.*, 1937, v. 99, July, p. 75.

Shortly after death the lenses were extracted within the capsule and examined under the slitlamp. After freezing, sections 30 microns thick were cut with the microtome and in an electric stove gradually heated to from 50 to 500°C. for twenty minutes and then

shortly to 600°C. In the ashes of youthful lenses the inorganic substances were equally distributed. With advancing age the ashes of the cortex increased in density but not from calcium. The nucleus consisted for the most part of calcium. Phosphates were chiefly found in young fibers. A part of the inorganic substances of the lens was bound to organic constituents. In the lens of a woman of 83 years spheroliths appeared as luminous stars in the total ashes giving the phosphate reaction. (Illustration.) C. Zimmermann.

Paula-Santos, B. **A case of empty lens capsule dislocated into the anterior chamber.** *Folia Clin. et Biol.*, 1937, v. 8, no. 1, pp. 14-15.

The patient, a workman of 78 years, had no memory of traumatism to the eyes. The right eye was atrophic. The left eye obtained 8/10 vision with plus 9.50 D. sphere. There was a diffuse opacity of the cornea near the limbus in the sector between the three and five o'clock positions. The pupillary margin of the iris was drawn toward the temporal side. At the 4-o'clock position, in the iridocorneal angle, was a large adhesion between the posterior surface of the cornea and the lateral sector of the iris, excluding only the sphincter margin, and the lateral portion of the lens capsule was incarcerated in this adhesion. The whole capsule was dislocated into the outer half of the anterior chamber. It did not contain any trace of lens substance, but appeared as an empty sac, irregularly folded, and floating with the movements of the eye. The iris was in large part atrophic. There were strings of vitreous humor in the anterior chamber, carrying some pigment. The author believes that the lens had been dislocated in childhood.

W. H. Crisp.

Puscariu, Elena. **Ignored syphilis in senile cataract.** *Ann. d'Ocul.*, 1937, v. 174, Sept., pp. 596-600.

The incidence of syphilis was studied in 1,357 patients who underwent cataract extraction. The Bordet-Wassermann reaction was positive in 14.1 percent of this number. Postoperative iritis developed in 19 percent of those with positive reactions and in only 3.74 percent of those with negative reactions. From this it may be deduced that latent syphilis is an important factor in the production of postoperative iritis.

John C. Long.

Vito, P. **Experimental cataract from defective alimentary regimen.** *Boll. d'Ocul.*, 1937, v. 16, March, pp. 263-275.

In numerous experiments made on white rats with a rhachitogenous diet, the only changes obtained were in the lens. Lens opacities of varying shape and location manifested themselves also in control rats fed with a regular diet. The writer discusses the pathogenesis of these cataracts and states that they do not originate from vitamin deficiency but from other factors at present unknown. (Bibliography.)

M. Lombardo.

Whalman, H. F. **Dinitrophenol cataract.** *Trans. Western Soc.*, 1936, 3rd mtg., pp. 182-186. (See *Amer. Jour. Ophth.*, 1936, v. 19, Oct., p. 885.)

## 10

### RETINA AND VITREOUS

Beigelman, M. **Fundus changes in leukemia.** *Trans. Western Ophth. Soc.*, 1935, 2nd mtg., pp. 19-25.

Out of a large number of cases examined clinically, the author was able to secure pathologic material in seven cases. In six the eye was fixed by in-

jecting a solution of formalin or Zenker's fluid into the vitreous within thirty minutes after death. (Many earlier reports on the pathology of leukemic changes were based on material obtained at autopsy without previous fixation of the eyeball.) The hemorrhages characteristic of leukemia were studied under the microscope. Leukocytes occurred only in the central part, corresponding with the white spot seen ophthalmoscopically. The periphery consisted of erythrocytes. The reason for this distribution is probably mechanical. The disc-shaped erythrocytes penetrate deeper into the surrounding tissue, travel faster than the leukocytes, and have less tendency to cohere. Sometimes the white spots characteristic of the leukemic retina are of hemorrhagic origin and consist only of leukocytes. Others are due to a localized degeneration of the nerve fibers. The microscope reveals enormous thickening of the nerve fibers, so that in cross-section they approach the size of ganglion cells. The ophthalmoscopic appearance of the veins is explained by distention of the vessels, with leukocytes and perivascular edema. In one case a leukocytic infiltration was found both around the optic nerve and between the bundles of nerve fibers—a combined perineuritis and interstitial neuritis. Clinically, this had been diagnosed as a mild optic neuritis. The characteristic picture of the retina in leukemia is explained by the retinal edema and some atrophic changes in the pigment epithelium, which allow the distended veins of the choroid, filled with leukocytes, to be seen with greater clarity than normally.

George N. Hosford.

Belgeri, F., and Dusseldorp, M. **Surgical results in relation to retinal tear, etiology, area of detachment, and age of**

patient. Arch. de Oft. de Buenos Aires, 1937, v. 12, June, p. 424.

Statistical study of 54 cases and 47 operations suggests the following conclusions. Neither the etiology (traumatic or myopic) nor the age of the detachment affects the number, size, or form of tears in the individual case. There is a greater tendency to multiplicity of tears in older individuals, but without any effect on size or form. Fifty-eight percent were myopic and 29 percent traumatic, and 23 percent of unknown origin. Single tears were more frequent than multiple ones. Fifty percent of the patients consulted the ophthalmologist within a month, and 50 percent responded favorably to operation. Neither the etiology nor the form of the tear affects the result of operation. All disinsertions, however, got well. These were almost always inferior, and were never seen in persons over 49 years. Results were best in persons below 30 years (few in number), without a macular tear among them. The majority of the tears were upper temporal and equatorial. In the traumatic cases they were mainly retroequatorial. The latter offer a poorer prognosis, and the upper poorer than the lower. The chance of success diminishes with the number of tears. One macular tear responded to operation.

M. Davidson.

Benedict, W. L. **The pathology of angioid streaks in the fundus oculi.** Jour. Amer. Med. Assoc., 1937, v. 109, Aug. 14, p. 473.

The enucleated right eye, blind from absolute glaucoma, of a patient who had typical angioid streaks in the left eye and pseudoxanthoma elasticum of the sides of the neck and the axillary folds, showed angioid streaks on direct inspection and by direct illumination. Microscopic examination, however,

failed to show any pathologic changes that could be identified as angioid streaks, nor could any of the proffered explanations of the condition be confirmed. (One figure.)

George H. Stine.

Cavka, Vladimir. **Contribution to anterior and posterior detachment of the vitreous.** Graefe's Arch., 1937, v. 137, pt. 3, p. 472.

The clinical findings in two cases of vitreous detachment are described. The first case is that of an eight-year-old boy with high myopia and vitreous detachment in both eyes. On examination of the vitreous detachment in the right eye with the slitlamp and contact glass, the impression was of vesicular elevation in the anterior part of the vitreous, which presented intensive swinging movements. To microscopic examination the netlike structure on the surface of the anteriorly detached vitreous proved to be elevated hyaloid membrane which was provided with many and somewhat irregularly round openings. In the second case, that of a 31-year-old man, the right eye was just recovering from an optic neuritis. At the first examination there could be noted at the inferior margin of the affected papilla a vertically elliptic ring which was delicately opaque at its margins. At this first examination the latter was considered to be a tear in the hyaloid membrane. Three days later, a posterior detachment of the vitreous was observed and the elliptic ring had moved downward about 1.5 p.d. The cause of the vitreous detachment in the first case was thought to be the high myopia and in the second the optic neuritis.

H. D. Lamb.

Cohen, Martin. **Lesions of the fundus in essential hypertension and in arterial**

and renal diseases. *Arch. of Ophth.*, 1937, v. 17, June, pp. 994-1007.

A descriptive classification of the fundus findings is presented and the changes found in essential hypertension, general arteriosclerosis, diabetes, and nephritis are discussed. The vascular lesions in 26 illustrative cases are reported and are shown by photomicrographs and drawings of the fundus. The fundus lesions in essential hypertension resemble those seen in the other conditions but are more severe except as compared with some types of nephritis. The lesions consist of marked venous stasis, arterial contraction, profuse hemorrhages, thrombosis, white plaques, macular lesions, and papilledema. Edema of the optic disc in malignant essential hypertension is significant of the end-stage, or the terminal nephritis, and indicates a grave prognosis.

J. Hewitt Judd.

Damel, C. S., Adrogué, E., and Malbran, J. **Three clinical and pathologic studies of exudative retinitis.** *Arch. de Oft. de Buenos Aires*, 1937, v. 12, June, p. 384.

Angiomatosis retinae and primary exudative retinitis are separate entities, although the former may be complicated by a superimposed exudative process in the retina and choroid. On the other hand, miliary aneurysms may be observed in primary exudative retinitis, but, as demonstrated by Balado in the case of the geniculate body, direct communication between artery and vein is normal in the cerebral circulation and this is true of the retinal circulation as well. One of the eyes was enucleated on suspicion of neoplasm, the other eyes were enucleated for secondary glaucoma. Pathologic study of the three cases established that exuda-

tive retinitis might exist without primary arteriovenous lesions. In none of the cases was the evidence sufficient to indicate a true retinal angiomatosis. Hemorrhages were not part of the picture. The fundamental pathology is an exudate detaching the retina. Vacuolization of the pigment epithelium is common. As Koyanagi has pointed out, the ghost cells are albuminous in content rather than fatty, supporting the original views of Leber.

M. Davidson.

Evans, P. J. **Familial macular colobomata.** *Brit. Jour. Ophth.*, 1937, v. 2, Sept., pp. 503-506.

The five patients were four brothers and a sister. From records available it was determined that the condition had been transmitted through the maternal side. There was no evidence of the ensuing generation being similarly afflicted. Aside from the ocular condition the five patients were physically normal. The female affected died leaving a daughter, a granddaughter, and a grandson, none of whom gave evidence of the ocular anomaly. (One figure, one photomicrograph.) D. F. Harbridge.

Ferrer, Horacio. **Topography of retinal detachment.** *Rev. Cubana Oto-Neuro-Oft.*, 1936, v. 5, Nov.-Dec., p. 169.

In order to visualize better the topography of the detachment to be operated on, Ferrer utilizes eye models of natural size, built around the available glass eye, and on which are drawn the papilla, macula, and parallels to correspond to ora and equator. On these models is also drawn a replica of the detachment, tear, disposition of the vessels, and position of the most prominent part of the subretinal fluid. These eyes, mounted on a horizontal bar, are kept

on view during operation and have been found very useful guides.

M. Davidson.

Fialho, Abreu, Jr. **Choroidal and retinal gyrate atrophy in a patient with genito-dystrophic gerodermia.** *Annaes de Ocul. do Rio de Janeiro*, 1937, 5th year, no. 5, pp. 15-34.

The genitalia of the patient, a workman 28 years of age, were juvenile in character. The pupillary reflexes were normal. Whenever even a weak beam of light was thrown upon the sclera at any point, a red reflex appeared in the pupil. Examination of the fundus showed a whitish tinge almost everywhere. The choroid and retina retained their normal aspect only in a limited zone around each optic disc. Particularly in the peripheral area this whitish fundus was dotted with black spots of various sizes but almost always larger than the black spots of typical pigmentary degeneration of the retina, and without the bone-corporcle appearance of that condition. The retinal veins were of normal size, but the arteries were decidedly atrophic. Vision was limited to counting fingers at 3 meters for the right eye, and 2 meters for the left eye.

The author presents an extensive discussion of the genito-glandular atrophies. His patient's parents were not blood relations.

W. H. Crisp.

Fortin, E. P. **Entoptic phenomena. Intraretinal liquids.** *Arch. de Oft. de Buenos Aires*, 1937, v. 12, April, p. 183.

The semiliquid retina with elements about one micron in thickness is not the same retina which the histologist sees after death, fixation, heat, and the microtome have modified it, and which is reproduced in the usual text book, generally after Ramon y Cajal. Its true

structure can be understood only by observation with the author's entoptoscope, and by realizing that the retina must have an osmotic interchange between its layers apart from the retinal circulation. The external segments of the cones reach as far as the pigment epithelium, just as do the rods. The feet of the cones are none other than the bell-shaped "corpuscles of Fortin," of optic rather than of neural significance. Henle's layer, wider than is assumed, is a liquid in which float fibers, several hundred microns in length and half a micron in width (that is of the length of light waves) and radiating from the fovea. Muller's fibers are conceivably channels instead of supporting tissue. There is a third layer of bloodless nonpulsating capillaries in relation with the cones, probably important in color vision. (Illustrated.)

M. Davidson.

Gradle, H. S. **The X-ray therapy of retinal-vein thrombosis.** *Amer. Jour. Ophth.*, 1937, v. 20, Nov., pp. 1125-1131; also *Trans. Pacific Coast Oto-Ophth. Soc.*, 1937, 25th mtg.

Henton, G. E., and Henton, G. H. C. **A case of opacities of the vitreous observed for twenty years after sclerocorneal trephining.** *Arch. of Ophth.*, 1937, v. 18, July, pp. 103-104.

Sclerocorneal trephining in an eye blinded six months before by massive intravitreal hemorrhage was followed by clearing of the vitreous and improvement of the vision to 20/30 six months later. The vision has remained constant for twenty years. J. Hewitt Judd.

Jackson, Edward. **Vision in pernicious anemia.** *Amer. Jour. Ophth.*, 1937, v. 20, Oct., pp. 1046-1047.

Jess, Adolf. **Temporary indentation of the sclera as aid in operation for retinal detachment.** *Klin. M. f. Augenh.*, 1937, v. 99, Sept., p. 318.

A threaded tampon is placed in Tenon's space through the conjunctival opening, on the part of the globe corresponding to the detachment. It exerts pressure on the relaxed sclera and approximates it with the choroid to the retina, facilitating reattachment. The conjunctiva is sutured and the tampon may remain up to two weeks. It has to be removed by carefully reopening the conjunctival wound after anesthesia of the conjunctiva and injection of novocaine behind the eyeball. (Illustration.)

C. Zimmermann.

Kapuscinski, W. J. **Albuminuric retinitis.** *Klinika Oczna*, 1937, v. 15, pts. 2-3, p. 207.

After a very exhaustive review of the literature the author reports on the histopathology of seven eyeballs. His conclusions are that retinopapillary edema is the initial manifestation. The changes in the nerve fibers give ophthalmoscopically the picture of edema or papillitis. Beyond the lamina cribrosa the optic nerve is intact except for lymphocytic infiltration of the walls of the central retinal vessels. The most marked and constant changes are detachment of the limitans interna, swelling of the ganglion layer, sclerosis of the vessels, and hemorrhages and partial atrophy of the nerve fibers. The homogeneous plaque in the intergranular layer did not contain fat, cholesterol, or fibrin. The intact limitans externa shows absence of invasion of the retina by pigment epithelium. There is but little involvement of pigment epithelium and choroid.

Ray K. Daily.

Keyes, J. E. L., and Goldblatt, H. **Experimental hypertension; clinical and pathologic studies of the eyes.** *Arch. of Ophth.*, 1937, v. 17, June, pp. 1040-1054.

This report is based on study of the abnormal changes detected ophthalmoscopically in eight dogs and one monkey with experimental hypertension produced by means of renal ischemia, and of the pathologic changes in the eyes of one of these animals in which the eyes were removed during life for histologic study after hypertension had existed for three years. Pathologic alterations were noted in all branches of the blood vessels but varied in intensity in the same blood vessel. The principal changes occurred in the intima, and varied from simple hypertrophy and hyperplasia of the muscle to advanced hyalinization of the intima and atrophy of the media. More diseased blood vessels were noted in the retina than in the choroid, iris, or ciliary body. The deep hemorrhages were absorbed more slowly than those in the internal layers of the retina, and were more prone to leave retinal scars and areas with iron-free pigment and iron-containing pigment. Detachment of the retinas which occurred was due to retinal and subretinal edema. (Fundus photographs and photomicrographs.)

J. Hewitt Judd.

Lijo Pavia, J. **A new transilluminator for retinal detachments.** *Arch. de Oft. de Buenos Aires*, 1937, v. 12, May, p. 246; also *Rev. Oto-Neuro-Oft.*, 1937, v. 12, June, p. 158.

For localization a transilluminator provided with a flexible tip is described. It facilitates transillumination of the nasal portion of the globe, otherwise inaccessible.

M. Davidson.

Lijo Pavia, J., and Bidegain, M. O. **Hypophysis and retina.** *Rev. Oto-Neuro-Oft.*, 1937, v. 12, May, p. 129.

After a Fukala operation in a case of high myopia (20 D.), vision continued to deteriorate because of progressive macular pigmentary degeneration in both eyes, in spite of antiluetic treatment indicated by laboratory tests. Hypophyseal therapy led to improvement in vision as well as in dark adaptation. The authors believe such therapy indicated in this type of case.

M. Davidson.

Lijo Pavia, J., and Tartari, R. A. **Multiple circumscribed detachment.** *Arch. de Oft. de Buenos Aires*, 1937, v. 12, July, p. 436; also *Rev. Oto-Neuro-Oft.*, 1937, v. 12, Aug., p. 221.

Fourteen months after a fall on the buttocks from a height of two feet while pruning a grapevine, the patient presented a large cystic detachment above and temporally near the ora serrata and a retinal cyst temporally from the disc. The latter was regarded as secondary to the detachment. (Illustrated.)

M. Davidson.

Löhlein, W. **Detachment and accident.** *Klin. M. f. Augenh.*, 1937, v. 99, Sept., p. 376. (See Section 16, Injuries.)

Mamoli, L. **A case of retinal detachment with macular hole treated experimentally by application of transbulbar diathermy.** *Ann. d'Ocul.*, 1937, v. 174, May, pp. 309-312.

A woman aged 31 years, with bilateral myopic macular degeneration, developed a hole in the left macula and retinal detachment. Based on previous experimental work on monkeys and rabbits an attempt was made to treat the macular hole by transbulbar ap-

proach. Diathermy was applied by means of a special needle electrode 3 cm. long and was insulated except for the conical point. After dissecting a conjunctival flap the needle was passed through the sclera 10 mm. from the limbus by diathermy. Under direct ophthalmoscopic guidance the tip of the needle was inserted into the macular hole and a current of 120 ma. was applied. The needle was rotated slightly to coagulate the region of the hole. Because of nervousness and other factors good postoperative immobility could not be maintained. Another retinal tear developed about four disc diameters from the macula and the retina became detached. The macular area was still in position when observed nine months postoperatively.

John C. Long.

Pfeiffer, R. L. **Hypersensitivity to pontocaine.** (Retinal detachment case.) *Arch. of Ophth.*, 1937, v. 18, July, p. 62. (See Section 2, Therapeutics and operations.)

Prewitt, L. H. **Retinal detachment due to allergy.** *Arch. of Ophth.*, 1937, v. 18, July, pp. 73-75.

A man aged 62 years had sudden loss of vision and the appearance of corrugations in the fundus associated with nodular swellings on the body. These recurred on numerous occasions before the retina became completely detached. The findings indicated an allergic basis. The appearance of blebs on the cornea coincident with a severe allergic reaction, and their simultaneous subsidence, seem to indicate that an allergic reaction may become localized on or within the eyeball. It is suggested that an allergic swelling in the choroid may be a factor in retinal detachment.

J. Hewitt Judd.

Reiser, K. A. **Retinal hemorrhage in grippe.** Zeit. f. Augenh., 1937, v. 92, July, p. 207.

In five patients, four of whom were young people, the author observed retinal hemorrhage which occurred in the early days of the disease accompanied by foggy vision. Although in some the hemorrhage was extensive, all made a good recovery. No other physical manifestation of disease elsewhere in the body aside from grippe could be found in any of them. F. Herbert Haessler.

Rintelen, F. **The histology of submacular senile pseudotumor (disciform degeneration of the retinal center, of Junius and Kuhnt).** Zeit. f. Augenh., 1937, v. 92, Aug., p. 306.

After a critical review of the literature, of the histologic findings in twelve eyes, and in particular of the views on pathogenesis, the author describes histologic studies on an eye observed by him. His findings support the view first expressed by Behr that the primary derangement is hyalin degeneration of the lamina elastica vitreae which results in disturbances of permeability and development of a transudate between retina and pigment epithelium. The latter becomes detached and proliferated, and undergoes metaplasia to a connective-tissue-like collagen tissue with paucity of nuclei. Thus an ectodermal tissue becomes modified to give rise to tissue products associated normally with mesoderm. The name originally given should be changed to "submacular senile pseudotumor."

F. Herbert Haessler.

Satanowsky, Paulina. **Concerning retinal detachment.** Arch. de Oft. de Buenos Aires, 1937, v. 12, June, p. 415.

General study of the patient during a preliminary rest in bed, and due rec-

ognition of constitutional factors such as lues and diabetes are advocated. Luetic detachment, generally without a tear, may be amenable to mercury. Distinction should be made between cases in which the tears are first to present themselves, and respond promptly to obliteration, and those in which they appear late in the detachment, require a more extensive field of cauterization, and offer a poorer prognosis. The genesis of the tear is looked for in local failure of choroidal nutrition, tears appearing early having been observed close to retinal vessels, while those making their appearance late are situated far from vessels. In the presence of tears and abundant subretinal fluid, surgical intervention may be attempted with success earlier than otherwise, but it is to be borne in mind that tears may lie hidden in retinal folds. While surgery is regarded as only mechanical in its effect, the writer reports 80 percent of successes in about 100 cases dealt with. The Linder-Guist operation is preferred in accessible lesions, and diathermy, especially with the Lacarrère electrode, in lesions back of the equator and in all lesions of the upper inner sector.

M. Davidson.

Scheyhing, Hans. **A rare case of angiomatous changes in the retina.** Klin. M. f. Augenh., 1937, v. 99, Sept., p. 362.

A laborer aged 21 years presented a multiform angiomatous formation projecting like a bunch of grapes along the upper and lower temporal veins of the right retina. It could not be connected with any stage of angiomatosis retinae. Very probably it was a rare case of angioma due to congenital malformation. (Illustration.) C. Zimmermann.

Spinelli, Francesco. **Pathogenesis of retinal tears and origin of detachment.**

Boll. d'Ocul., 1937, v. 16, March, pp. 315-326.

A man of 47 years affected by retinal detachment, with multiple tears in the upper temporal quadrant of the right eye, showed also a round spot of retinal atrophy in the lower nasal quadrant. In the course of diathermic treatment of the detachment the spot disappeared and in its place remained a hole around which the retina became subsequently separated. From this observation the writer infers that a retinal tear may result from primary retinal atrophy. In this case the fluid vitreous, with its movements, becomes a factor in production of the tear. (Bibliography, 3 color figures.) M. Lombardo.

Suganuma, Sadao. **Anatomic findings in an eyeball with juvenile relapsing intraocular hemorrhage, complicated by tuberculous sclerokeratitis.** Klin. M. f. Augenh., 1937, v. 99, Sept., p. 367.

A woman of 21 years showed tuberculous sclero-kerato-iritis of the left eye and juvenile relapsing retina-vitreous hemorrhages in the right eye. Both lung apices were infiltrated, but nowhere in the body were there signs of Bürger's disease. In July, 1936, tuberculous iritis, scleritis, and keratitis set in in the right eye, followed by glaucoma, which necessitated enucleation. A periphlebitic focus was found in the retina at the equator with epithelioid cells and a large giant cell. The case is regarded as giving decided proof that relapsing juvenile intraocular hemorrhages are due to vascular tuberculosis of the retina. (Illustration.) C. Zimmermann.

Sugita, Y. **The occurrence of spontaneous retinal detachment, particularly the physiochemistry of its method of formation.** Graefe's Arch., 1937, v. 137, pt. 3, p. 447.

When an enucleated animal eye remains for a time in a concentrated electrolytic or nonelectrolytic aqueous solution, retinal detachment occurs in a short time. This may be a process similar to the plasmolysis of plant cells. When different electrolytes or nonelectrolytes are injected into the vitreous of an enucleated animal eye, increasing thereby the osmotic concentration, retinal detachment occurs. The cause of the latter may be loss of water from the retina into the vitreous, leading to diminution in volume of the retina, a process resembling the plasmolysis of plant cells. The spontaneous retinal detachment in man which is always accompanied by liquefaction of the vitreous may be produced by the same process, because of increased osmotic concentration of the vitreous when it liquifies. In this process, protoplasmal hysteresis in the myopic or senile retinal cells has a considerable share. Retinal tears and other clinical findings are easily explained on the basis of this physiochemical process.

H. D. Lamb.

Uyama, Yasuo. **Occurrence of so-called "thromboangiitis obliterans of the eye"; with anatomic examination.** Graefe's Arch., 1937, v. 137, pt. 3, p. 438.

In a man of 24 and a woman of 35 years the author was able to observe for six months and longer high-grade disease of the retinal blood vessels, typical of thromboangiitis obliterans (Bürger). In various other parts of the body there occurred symptoms characteristic of this disease. The retinal blood vessels in both cases chiefly presented clinically high degrees of perivasculitis and endovasculitis. Arteries and veins were both involved, in the first case the veins

to a greater extent and in the second the arteries.

Because of the failure of vision and increased tension in one eye of the first case, enucleation was done. Anatomic examination of this eye confirmed the enormous thickening of the retinal arteries and veins as determined clinically. The intima was particularly affected with new-formed collagenous and elastic tissue fibers. From the latter increase together with swelling of the vessel wall, a pronounced narrowing of the lumen as well as its complete blocking may ensue. This change is especially frequent in the small peripheral vessels.

H. D. Lamb.

Walker, C. V. **Galvanic treatment of separated retina.** Trans. Western Ophth. Soc., 1935, 2nd mtg., pp. 55-63.

A description of the galvanic apparatus devised and used by Walker, with description of his technique. He believes that this method will finally become the method of first choice to apply to a macular hole as well as to a peripheral hole.

George N. Hosford.

Wilczek, Marian. **A rare retinal vascular anomaly in association with angiomas retinae.** Klinika Oczna, 1937, v. 15, pts. 2-3, p. 167.

A very unusual anomaly of the fundus was observed in the right eye of a woman 22 years of age. A vein pursuing its normal course from the papilla penetrated deeply at the equator. At this point it gave off two branches, one of which anastomosed with a temporal artery below the macula. All these vessels were dilated and carried arteriovenous blood. Scattered through the retina were numerous small arteriovenous aneurysms, which the author re-

gards as the initial stage of Hippel's disease. (Illustrations.)

Ray K. Daily.

## 11

### OPTIC NERVE AND TOXIC AMBLYOPIAS

Bucy, P. C. **Toxic optic neuritis resulting from sulfanilamide.** Jour. Amer. Med. Assoc., 1937, v. 109, Sept. 25, p. 1007.

A girl with osteomyelitis of the ilium was given sulfanilamide on three separate occasions. On each occasion toxic manifestations appeared; headache, cyanosis, diarrhea. A choking sensation was experienced on the first two occasions, and on the last occasion severe loss of vision due to toxic optic neuritis after administration of a single tablet (0.3 gm.) of the drug. In each instance the symptoms rapidly subsided after withdrawal of the drug. (Visual fields.)

George H. Stine.

Davidoff, L. M., and Dyke, C. G. **Hypertensive meningeal hydrops.** Amer. Jour. Ophth., 1937, v. 20, Sept., pp. 908-927.

Desvignes, Pierre. **The syndrome of direct compression of the intracranial portion of the optic nerve.** Ann. d'Ocul., 1937, v. 174, May, pp. 289-308.

Intracranial compression of the optic nerve may be caused by tumors of the inferior portion of the frontal lobe, aneurysms of the internal carotid or its branches, hydrocephalus, arteriosclerosis, or arachnoid cysts or bands. The first symptom is usually a marked unilateral lowering of central visual acuity from a central scotoma. Other field defects may occur, but the central scotoma is constant and early. The fundi may appear entirely normal or, if late, there may be primary optic atrophy

with complete blindness. The syndrome of Foster Kennedy may be encountered. Unilateral headache sometimes occurs. For diagnosis a complete neurologic examination including study of the sense of smell is important. Exostoses or erosions may be demonstrated by X ray. Ventriculography is of value. Prompt surgical intervention is important if vision is to be preserved.

John C. Long.

Fralick, F. B., and DeJong, R. N. **Neuromyelitis optica.** *Amer. Jour. Opth.*, 1937, v. 20, Nov., pp. 1119-1124.

Jeffers, W. A., Griffith, J. Q., Jr., Fry, W. E., and Fewell, A. G. **An experimental study of choked disc in the rat.** *Amer. Jour. Opth.*, 1937, v. 20, Sept., pp. 881-886.

Kyrieleis, Werner. **Brief remarks on the problem of choked disc.** *Graefe's Arch.*, 1937, v. 137, pt. 3, p. 481.

This article pertains to a recent work by Sobański on dynamometric findings in explanation of the origin of choked disc (see *Amer. Jour. Opth.*, 1937, v. 20, p. 876). The present writer corrects the statement of Sobański that Kyrieleis' work is a repetition of his own. Kyrieleis' first research was published about five years before (see *Amer. Jour. Opth.*, 1929, v. 12, p. 542) that of Sobański. Kyrieleis' observations are represented as more valuable because the experiments for choked disc were performed on rhesus monkeys, where anatomic conditions are more like those in man. Conclusions for the genesis of disease in man can only to a limited degree be derived from experiments on dogs, particularly when dealing with artificial influence on the blood vessels. Kyrieleis does not agree with Sobański therefore that the basic factor for swelling of the papilla is a definite relation

between pressure in the central retinal vein and diastolic pressure in the central retinal artery. It is much more probable that such a relation is secondary to changes in the optic nerve.

H. D. Lamb.

Lauber, Jan. **The effect of hypotony on atrophy of the retina and optic nerve.** *Klinika Oczna*, 1937, v. 15, pts. 2-3, p. 230.

In contradistinction to the voluminous literature on the relation of general hypertension to ocular disease the literature on the relation of general hypotension to ocular disease is very meager. For proper functioning of the ocular circulation, which is responsible for sustenance of the nervous elements, the diastolic retinal pressure must exceed the intraocular pressure by at least 20 mm. of mercury. A fall in the diastolic blood pressure and a rise in the intraocular pressure are equally dangerous. In glaucoma we have an example of a disturbed ocular circulation caused by increased intraocular pressure. High general blood pressure is an advantage in glaucoma, and lowering of the general blood pressure while the intraocular pressure remains high is definitely contraindicated. As an example of a disturbance in ocular circulation caused by general hypotension with normal intraocular pressure may be cited the well known visual disturbances following severe hemorrhages. This relation is very important in the treatment of syphilis, because most antisyphilitic remedies have a lowering effect on blood pressure. Patients with hypertension stand antisyphilitic treatment better, in relation to the effect on the optic nerve, than patients with normal blood pressure. In the author's experience attempts to raise the general blood pressure have not proved very effective in

arresting degeneration of the optic nerve and retina. But reduction of intraocular pressure by miotics or cyclo-dialysis has proved efficacious, and patients in whom vision had been damaged by antiluetic treatment could continue the treatment without further injury to their optic nerves. These investigations indicate that the injurious action of antiluetic treatment is not chemical but mechanical. They also call for careful study of intraocular and ocular pressures preliminary to antiluetic therapy.

Ray K. Daily.

Mattos, W. B. **Congenital epipapillary membrane.** *Rev. de Ophth. de São Paulo*, 1936, v. 5, Dec., pp. 97-99.

The left eye was normal. The right eye was normal with the exception of the epipapillary membrane, which almost completely covered the disc, was of whitish-yellow color, and lay at a slightly more superficial level than the disc itself. There were adhesions between the membrane and the inferior nasal and inferior temporal veins. It was impossible to say whether there was adhesion to the center of the disc. The vessels of the disc could be made out through the semitransparent membrane.

W. H. Crisp.

Moore, J. I. **An etiologic study of a series of optic neuropathies.** *Amer. Jour. Ophth.*, 1937, v. 20, Nov., pp. 1099-1108.

Russo, Antonio. **Optic neuritis from measles.** *Boll. d'Ocul.*, 1937, v. 16, March, pp. 276-298.

After mild attacks of measles three children showed marked defects of vision due to primary optic neuritis in two cases and acute retrobulbar neuritis in the other. The two cases of optic

atrophy led to total blindness, but in the third case residual vision of 3/50 was obtained. The writer argues that the ocular complications were probably due to direct action of toxins reaching the optic nerve through the hematic or lymphatic channels, in association with a peculiar congenital or acquired lability of the nervous system. (Bibliography and four figures.)

M. Lombardo.

Sales, Monteiro. **Luetic atrophy of the optic nerves, 23 cases.** *Arquivos do Inst. Penido Burnier (Brazil)*, 1937, v. 4, June, pp. 281-301.

The age of the patients was between 21 and 62 years. The interval between the primary lesion and the ocular manifestations varied from a few months to 39 years; the visual defect from complete blindness of both eyes to 0.7 for the better eye. There was no relationship between the duration of the general disease and the gravity of the eye lesion. In six cases optic atrophy was the only symptom. In seventeen cases there was involvement of other parts of the nervous system: the eighth pair in two cases, medullary lesions fifteen cases; these lesions being serious or benign, and accompanied or not by mental disturbances.

The Wassermann and Kahn reactions were always positive in the blood. The cerebrospinal reaction was only once negative, namely in a case of tabes at the stage of sclerosis. In every other case the cerebrospinal fluid showed more or less characteristic changes and the Wassermann reaction was always positive. Metaluetic involvement of the optic nerves may appear before or after medullary involvement, but it does not prevent progress of the ataxia.

W. H. Crisp.

12

VISUAL TRACTS AND CENTERS

Harrington, D. O. **The optic radiation from the temporal lobe.** Trans. Western Ophth. Soc., 1936, 3rd mtg., pp. 131-137.

Evidence is presented that the rearrangement of homologous fibers and corresponding retinal points appears to take place deep in the temporal lobe, between the geniculate body and the anterior inferior portion of the parietal lobe. The author believes that careful quantitative perimetry is of the greatest value in precise localization of lesions of the temporal lobe.

George N. Hosford.

Juba, A., and Szatmári, A. **On rare cerebral anatomic conditions in cases of unilateral peripheral blindness.** Klin. M. f. Augenh., 1937, v. 99, Aug., p. 173.

In a case of long-standing unilateral peripheral blindness, typical alternating atrophies of the external geniculate bodies and certain changes of the area striata were encountered, which were correlated with a lesion of the first optical neuron. In the foreground stood atrophy of the fourth stratum. In a similar second case and one of bilateral optic atrophy, the visual cortices were intact. In the second case of unilateral optic atrophy the degenerations were combined with an affection of the papillomacular system. As a consequence, indistinctness of the distribution of the lamellar atrophy could be observed.

C. Zimmermann.

Levitt, J. M. **Tumor of the optic chiasm and optic nerves.** Arch. of Ophth., 1937, v. 18, July, pp. 91-94.

A woman aged 43 years gave a history of slow progressive loss of vision of the left eye of many years duration and of exophthalmos and ptosis of this

eye of recent onset. There was a divergent strabismus and a primary optic atrophy of the left eye. The visual fields of the right eye showed temporal hemiachromatopsia for red and green. Roentgenograms of the skull revealed a shallow sella turcica with erosion of the anterior and posterior clinoid processes and of the left sphenoid ridge as well as enlargement of the left optic foramen. A massive chiasmal tumor was disclosed at operation. Necropsy showed the tumor apparently arising from the chiasm and spreading laterally to involve both optic nerves, and on the left extending into the orbit and causing the proptosis.

J. Hewitt Judd.

Schliver, Kaufman. **Ocular manifestations of malignant nasopharyngeal tumors.** Arch. of Ophth., 1937, v. 17, June, pp. 1055-1072.

The literature is reviewed and the findings in thirty-eight cases are summarized. Of this group the sixteen having symptoms referable to the eye are reported in detail. When ocular signs are present, the tumor has already invaded the skull. Involvement of the cervical glands is not so common as is usually reported. The ocular signs in this group were as follows: involvement of the fifth nerve in twelve cases, Horner's syndrome in ten, sixth nerve involvement in eight, involvement of the facial nerve in five, ophthalmoplegia interna and externa in four, exophthalmos in three, ptosis in two, papilledema in one, papillitis in one, atrophy of the optic nerve in one, and a mass in the orbit in one. Two of the patients presented a syndrome of the sphenoid fissure, that is, paralysis of the third, fourth, and sixth nerves and of the ophthalmic division of the fifth nerve. (Discussion)

J. Hewitt Judd.

Stella, H. de, and Hoorens, A. **Contribution to the physiology of the cerebellum in relation to oculomotor functions.** Bull. de l'Acad. Royale de Méd. de Belgique, 1936, series 6, v. 1, no. 11, pp. 542-545.

From experiments on monkeys, these authors conclude that the cerebellum does play a part in the control of oculomotor function, especially lateral and conjugate movements. W. H. Crisp.

Wölflin, E. **Improvement of vision and enlargement of the visual fields after operations on tumors of the hypophysis.** Klin. M. f. Augenh., 1937, v. 99, Aug., p. 168.

A case of bitemporal hemianopsia, pale optic discs, and greatly reduced vision caused by a tumor of the hypophysis was observed for a year after operation. After four months the vision of the right eye had increased by 0.3, that of the left eye by 0.4, with enlargement of the visual fields. Similar cases quoted from the literature showed no further improvement after about four months. In acute cases the improvement of vision is probably due to subsidence of edema, and in those of slow course it may be attributed to relief from pressure by the tumor; provided the interruption of blood supply has produced a functional but no anatomic lesion of the optic fibers. Cases improved by roentgen radiation are not considered in this article.

C. Zimmermann.

### 13

#### EYEBALL AND ORBIT

Anthony, D. H. **An enucleation compressor.** Arch. of Ophth., 1937, v. 18, Aug., pp. 274.

This instrument is a rod with olive-shaped tips, 14 mm. and 11 mm. in diameter, which are used to make pres-

sure at the apex of the orbit to compress bleeding vessels while sutures are being inserted. (Photographs.)

J. Hewitt Judd.

Avalos, Enrique. **Injuries to the external angular process (Orbit.).** Rev. Cubana de Oto-Neuro-Oft., 1937, v. 6, March-June, p. 38.

Of the six cases reported, two were complicated by optic atrophy, two by optic neuritis, one by a corneal ulcer, and one by iridocyclitis. Attention is called to the possibility of hysteric amaurosis in such cases.

M. Davidson.

Baratta, Orazio. **Congenital familial iris changes.** Boll. d'Ocul., 1937, v. 16, March, p. 339. (See Section 7, Uveal tract, sympathetic disease, and aqueous humor.)

Browder, Jefferson. **Treatment of carotid artery-cavernous sinus fistula.** Arch. of Ophth., 1937, v. 18, July, pp. 95-102.

A man aged 33 years, complained of headache, vomiting, and failing vision. He was found to have a traumatic carotid artery-cavernous sinus fistula on the right side as a result of an injury at seven years of age. Ligation of the common and internal carotid arteries failed to give relief. Enormously enlarged and anomalous veins in the region of the optic chiasm were found at operation. Ligation of the intracranial portion of the internal carotid artery could not be done, since the internal carotid artery was implicated in the aneurysmal formation and there was not space enough between the point of emergence of the internal carotid artery and its bifurcation into the anterior and middle cerebral arteries to permit application of a compression clip. However, a satisfactory result was

obtained by filling the aneurysmal cavity with a piece of temporal muscle.

J. Hewitt Judd.

Gasteiger, H. **Malformations of the iris and of the angle of the anterior chamber, and their clinical significance.** Klin. M. f. Augenh., 1937, v. 99, July, p. 36.

Clinical histories of twelve cases of malformation of the iris, such as coloboma, ectopia of the pupil, cleft of the anterior layer, atrophy, remnants of pupillary membrane, aniridia, and bulging of stroma and pigment layer of the iris, are reported in detail. These are due to disturbances of the mesoderm (dysgenesis mesodermalis). Their effects on obstruction of the angle of the anterior chamber with consequent glaucoma are discussed in detail.

C. Zimmermann.

Kindt, P. **A case of spontaneously healed congenital hydrophthalmos.** Acta Ophth., 1937, v. 15, pt. 3, p. 332.

The author makes this diagnosis on a five-year-old boy, with large cornea, ruptures in Descemet's membrane, and normal tension and eyegrounds.

Ray K. Daily.

Laval, Joseph. **Metastatic panophthalmitis from pyogenic cutaneous infections.** Arch. of Ophth., 1937, v. 18, July, pp. 104-106.

Two cases of metastatic panophthalmitis followed pyogenic infections of the skin. Each resulted in loss of the eye.

J. Hewitt Judd.

Lazar, N. K. **An unusual recovery from the endophthalmitis of meningococcus meningitis.** Amer. Jour. Ophth., 1937, v. 20, Sept., pp. 928-929.

Moore, R. F. **Five unusual cases of proptosis.** Brit. Jour. Ophth., 1937, v. 21, Sept., pp. 465-472.

The author includes four cases in which none of the ordinary causes of proptosis ensue. Diagnoses of the cases in point are declared to be lacking in finality. In one there had been a history of blockage of the femoral artery; in another of a wound over the right eye; in a third a spontaneous leakage from a diseased internal carotid artery, while in the fourth and fifth instances the author accepted, with no alternative explanations, noninfective thrombosis of the cavernous sinus and of toxin infiltrating the orbital tissues as the probable respective causes, although in the fifth case the patient attributed the condition to the sting of a bee.

D. F. Harbridge.

Pont and Lapierre, V. **Presentation of a case of articulated upper orolabio-naso-labial prosthesis.** Revue de Chirurgie Structrice, 1937, 7th year, March, pp. 38-42.

After an experience of eight years the authors recommend acetylcellulose as durable, light, either translucent or transparent as required, elastic, noninflammable, taking permanent paints, and well adapted for having fastened to it various accessories such as springs, hair, or an eye. An example described and illustrated includes three movable prostheses, an orbito-ocular, a nasal, and a superior labial.

W. H. Crisp.

Schliver, Kaufman. **Ocular manifestations of malignant nasopharyngeal tumors.** Arch. of Ophth., 1937, v. 17, June, p. 1055. (See Section 12, Visual tracts and centers.)

Schmidt, R. **A rare malformation of the human eye.** Klin. M. f. Augenh., 1937, v. 99, July, p. 56.

The eyelids of a new-born child were very much retracted and could not be

opened. It died nineteen hours after birth, and the autopsy report is given. Both orbits and the eyelids with their adnexa were normally developed but each globe was represented by glioma tissue of the size of a hazel nut, the larger part of which lay in the cranial cavity upon the orbital roof, and only a small part in the orbit. Above this extended a fine vascularized net of connective tissue which corresponded to the soft meninges. At its posterior, inverted end a differentiated nerve tissue represented the embryonic foundation of the retina. From here a continuous layer of pigment cells extended to the region of the sphenoid, which contained a lens bud of typical structure. Further back in the cranial cavity no trace of optic nerve was found, the cranial cavity merely containing a large cyst filled with fluid. In the orbit between the normal ocular muscles were visible fat tissue and cysts lined with pigment epithelium. The disturbance of development must have occurred in the first few months of fetal life. (Illustration.)

C. Zimmermann.

Soriano, F. J., and Picoli, H. R. **Orbital varices.** Arch. de Oft. de Buenos Aires, 1937, v. 12, June, p. 409.

Apropos of two cases reported, one of subcutaneous bluish varix at the upper inner orbital angle, and the other intra-orbital with enophthalmos normally and exophthalmos on head-flexion, the author points out that the main differential diagnostic feature from pulsating exophthalmos and cavernous angioma is the variability and intermittency of the exophthalmos.

M. Davidson.

Spaeth, E. B. **Pathogenesis of unilateral exophthalmos.** Arch. of Ophth., 1937, v. 18, July, pp. 107-148.

The author briefly discusses the various etiologic conditions responsible for unilateral exophthalmos, using a classification which groups them into anatomic, traumatic, and inflammatory conditions; diseases of the blood, lymph, and hematopoietic systems; and space-taking orbital lesions, which include cyst, gumma, benign neoplasm, malignant neoplasm primary in the orbit, and metastatic and invasive orbital neoplasm. (Numerous photographs.)

J. Hewitt Judd.

Townsend, J. F. **Bilateral orbital granuloma.** Jour. Amer. Med. Assoc., 1937, v. 108, May 15, p. 1705.

In the case reported there was massive chronic inflammatory granuloma of both orbits and optic nerves, the chiasm, and the lower part of the abdomen, with hydronephrosis from the ureteral obstruction by granulomatous masses. The orbital growth was retrobulbar. (2 figures.) George H. Stine.

## 14

### EYELIDS AND LACRIMAL APPARATUS

Buschke, W. **An improved chalazion forceps.** Klin. M. f. Augenh., 1937, v. 99, Aug., p. 251.

The ring of the perforated arm of the Desmarres lid forceps bears teeth which on closure fit into indentations of the solid branch, to prevent slipping.

C. Zimmermann.

Cooper, E. L. **The jaw-winking phenomenon.** Arch. of Ophth., 1937, v. 18, Aug., pp. 198-203.

The author reviews the literature and reports the case of a woman aged 41 years who presented a slight ptosis of the right upper lid. On chewing vigorously the upper lid moved up and down rapidly. When the lower jaw was

moved downward there was a retraction of the upper lid, which was much more pronounced when she moved the lower jaw to the left. J. Hewitt Judd.

Dimitri, V. **Blepharospasm and facial convulsions.** *Oftalmologia* (Buenos Aires), v. 2, pp. 74-77.

This is a brief general review of the subject.

Dupuy-Dutemps, L. **Margino-cutaneous blepharopexy in lid repairs.** *Ann. d'Ocul.*, 1937, v. 174, May, pp. 312-317.

In repair of extensive lid defects, where tarsorrhaphy is inadequate to prevent retraction of the lid margins, a more radical type of lid closure may be employed. The closure of a large defect of the lower lid is described to illustrate the method. After preparing the damaged area for grafting, an incision is made in the skin of the upper lid well above the lash margin. An intermarginal incision is made in the lower lid. The intermarginal defect is sutured into the gaping incision of the upper lid. In this way the lower lid is stretched over the upper lid and held by adhesions. The original defect is closed by grafting. After a suitable healing period the adhesions between upper and lower lid are cut, allowing the lids to assume their normal positions. (Illustrated.)

John C. Long.

Fazakas, Alexander, **Tumors of the lacrimal canaliculus, their extirpation, and restoration of the passage of tears.** *Klin. M. f. Augenh.*, 1937, v. 99, Sept., p. 372.

In two cases, of papilloma and granuloma respectively of the lacrimal papilla of the lower lid, the lower punctum was invisible. By a circular incision the granuloma was removed from the papilla, and the wound was cau-

terized with lunar caustic. The papilloma filled the interior of the canaliculus, so that its vertical portion, the pars papillaris, had to be extirpated. A new obtuse angle was successfully formed around the slit. C. Zimmermann.

Fehler, Hannah. **On lymphosarcomatosis starting from the lacrimal gland.** *Klin. M. f. Augenh.*, 1937, v. 99, July, p. 92.

The chief early symptoms were right exophthalmos and tumor of the lacrimal gland, followed after extirpation by multiple swellings of the lymphatic glands, which promptly subsided after radiation with roentgen rays. After eighteen months the blood picture was normal. The diagnosis of lymphosarcomatosis must be verified by the blood picture and histologic examination of an affected gland. C. Zimmermann.

Gallino, J. A., and Victorio Re, B. **Slow motion picture of the Marcus Gunn phenomenon.** *Arch. de Oft. de Buenos Aires*, 1937, v. 12, May, p. 234.

Attention is called to the advantage of motion pictures to study the phenomenon. The case described showed also synkinesia between the elevator and the hypoglossus, abduction of the tongue being accompanied by lid elevation on the side affected. The case is therefore reported as one of complex Marcus Gunn syndrome. (Illustrated.) M. Davidson.

Grüninger, Wolfgang. **A degenerated carcinomatous cylindroma of the lacrimal gland.** *Klin. M. f. Augenh.*, 1937, v. 99, July, p. 93.

Extirpation of a cylindroma of the right lacrimal gland in a man of seventeen years was followed within two years by several recurrences necessitating exenteration of the orbit. After

two years a new recurrence broke into the nasal sinuses and the anterior cranial cavity. The left optic nerve was completely surrounded and was compressed by the tumor masses, with blindness of the left eye. An extensive nasal operation failed to remove the tumors entirely, and the patient died shortly after. Early radical extirpation is urged in such cases. C. Zimmermann.

Hughes, W. L. **A new method for rebuilding a lower lid.** *Arch. of Ophth.*, 1937, v. 17, June, pp. 1008-1017.

An epithelioma involving the entire lower lid necessitated its complete removal. Satisfactory cosmetic and functional results were obtained by a new method of reconstruction. The upper lid was split into two layers. The inner layer composed of the tarsus with the attached levator was pulled down and attached to the conjunctiva in the lower fornix. The skin of the cheek was undermined, pulled up, and united to the anterior surface of the tarsus so that its upper border occupied a transverse position midway between the upper and lower border of the tarsus, giving complete closure of the conjunctival sac except for the medial canthus. One month later a row of hairs was transplanted from the opposite eyebrow to the anterior surface of the tarsus just below and parallel to the upper row of lashes. Three months after the original procedure a transverse incision was made between the two rows of lashes, freeing a complete new lower lid. The steps of the procedure are shown by photographs and diagrams.

J. Hewitt Judd.

Juraszyska, Janina. **Bactericidal action of tears.** *Klinika Oczna.*, 1937, v. 15, pts. 2-3, p. 182.

After a review of the current litera-

ture, the author gives a detailed report of her own investigation on 45 cases. She concludes that tears exert a bactericidal action on staphylococcus aureus and the streptococcus, but have no influence on *Bacillus coli*. This action is independent of the salt content. Ray K. Daily.

Nizetić, Zdravko. **Dacryorhinostomy according to Arruga.** *Klin. M. f. Augenh.*, 1937, v. 99, Sept., p. 314.

Clinical histories of four cases are reported. The tear sacs had been extirpated several years before. In the first case was found a large piece of the sac which could be included in the suture of the nasal mucous membrane and of the scar tissue. In the fourth case an intact tear sac filled with pus was encountered. Dacrocystorhinostomy cured this in a week. Arruga's operation is especially recommended as simple and giving a good prognosis.

C. Zimmermann.

Nizetić, Zdravko. **Sutures in the depth.** *Ann. d'Ocul.*, 1937, v. 174, Aug., pp. 542-544.

In the usual operations of dacryocystorhinostomy the nasal mucosa and the wall of the lacrimal sac are sutured together. This is an important procedure but difficult because of the depth of the small wound. Nizetic has devised forceps to facilitate the tying of the sutures. They are modified anatomic forceps with notches at the tips. (Illustrations.) John C. Long.

Robert, Georges. **The true nature of chalazion. Its relationship to ametropia.** *Ann. d'Ocul.*, 1937, v. 174, July, pp. 473-477.

Chalazion is a retention cyst occurring only in eyes with a refractive error. Nearly all cases of chalazion may be

cured in time by rigorous correction of the refractive error which has caused it. To obtain satisfactory results one must pay attention to even very slight refractive errors. In the majority of cases the author relies largely on objective measurement of the ametropia in prescribing lenses.

John C. Long.

Sakler, B. R. **Plastic repair of lid hernia with fascia lata.** Amer. Jour. Ophth., 1937, v. 20, Sept., pp. 936-938.

Schwab, Paul. **The treatment of diseases of the lacrimal passages.** Klin. M. f. Augenh., 1937, v. 99, July, p. 94.

In 57 out of 60 cases operated on by Toti's dacryocystorhinostomy a permanent cure was obtained. It is pointed out that Toti's method is essentially superior to extirpation of the tear sac. Sufficient size of the hole in the bone and exact suture of the mucous membrane are important. In preliminary examination and formulation of the indication, roentgen study of the nose is of great value.

C. Zimmermann.

Walsh, T. E., and Bothman, L. **Some results of intranasal dacryocystorhinostomy.** Amer. Jour. Ophth., 1937, v. 20, Sept., pp. 939-941.

Wieczorek, Anton. **A study on the pathology of the nasolacrimal passages.** Klinika Oczna, 1937, v. 15, pts. 2-3, p. 190.

This study correlates the bony structure of the orbit with lacrimal pathology, through the data of measurements of the lacrimal fossae of six hundred patients, of whom three hundred had nasolacrimal pathology. The author's studies indicate that the height of the nose is in definite relation to the size of the nasolacrimal canal and the

pressure under which tears pass. With a syringe attached to a spring manometer the author demonstrated that it takes considerably more pressure to irrigate the sacs of persons with low flat noses than those of persons with high thin noses. The difference in pressure required was particularly pronounced in cases with pathology in the inferior nasal meatus. The conclusions are that the anatomic structure of the lacrimal passages may in itself be a predisposing factor to pathologic involvement. (Illustrations.)

Ray K. Daily.

Woronych, N. **Ectropion of the upper lid.** Klinika Oczna, 1937, v. 15, pts. 2-3, p. 262.

The author saw four cases of ectropion of the upper lids complicating acute conjunctivitis. These eyes had been treated with bandages, strong medicaments, and Snellen sutures. The condition promptly subsided under open treatment with irrigations of cyanide of mercury and instillation of collargol. The author explains the pathogenesis of this condition by an edema of the superior fornix, which causes weakening of the pars ciliaris of the orbicularis and of the levator: Under these conditions, he believes, an awkwardly applied bandage caused eversion of the lid.

Ray K. Daily.

## 15

### TUMORS

Almeida, A. de, and Sales, M. **Epi-bulbar tumors.** Arquivos do Inst. Penido Burnier (Brazil), 1937, v. 4, June, pp. 333-344. (See Amer. Jour. Ophth., 1937, v. 20, Sept., p. 972.)

Evans, P. J. **Atrophy of the optic nerve and nevus flammeus associated with hemangioma of the choroid.** Arch.

of Ophth., 1937, v. 18, Aug., pp. 193-197.

A boy, aged 12 years, presented a nevus flammeus limited to the left side of the face and to the skin area supplied by the maxillary division of the trigeminal nerve with some overlapping into the area of the ophthalmic division. The mucous membranes of the left cheek, of the left side of the upper jaw, and of the hard and soft palates were involved. The right eye was normal, but the left eye was painful and blind from secondary glaucoma. It presented a ciliary blush, dilated conjunctival vessels, corneal edema, and shallow anterior chamber with a small hyphema and an intumescent opaque lens. Vessels of the iris were prominent and transillumination gave a diminished reflex. After enucleation, the histologic examination revealed vascularization of the cornea, anterior synechia, degenerated lens, detached retina, a large angioma of the choroid, and a cupped disk. From the history it is thought there had been repeated hemorrhages from the choroidal hemangioma, giving rise to hypertension and degeneration and detachment of the retina. (Colored photograph, photomicrographs.)

J. Hewitt Judd.

Evans, P. J. **The use of radon in the treatment of metastatic carcinoma of the choroid.** Brit. Jour. Ophth., 1937, v. 21, Sept., pp. 496-502.

Metastatic carcinoma in both eyes was secondary to tumor of the breast. The left eye, first affected, was excised, and the right eye was treated by application of radon seeds. The patient, while losing in weight and giving evidence of further metastases, remains active five years after the breast operation and retains good vision in the remaining eye twelve months after the

choroidal metastasis. For a period of seven months there has been no sign of recurring trouble in the eye treated with radon by the method minutely described. (7 photomicrographs.)

D. F. Harbridge.

Hagedoorn, A. **Adenocarcinoma of a meibomian gland.** Arch. of Ophth., 1937, v. 18, July, pp. 50-56.

Three cases with a basic architectural feature similar to that in the case previously described are reported and illustrated by photographs and photomicrographs. This glandular carcinoma consists chiefly of bands of sebaceous mother cells and sebaceous cells, or of solid masses of sebaceous cells, cysts, and papilloma-like growth. Many cells were present which showed a tendency to metamorphose as cells of stratified epithelium.

J. Hewitt Judd.

McLean, J. M. **Astrocytoma (true glioma) of the retina.** Arch. of Ophth., 1937, v. 18, Aug., pp. 255-262.

This type of tumor has apparently not been reported previously. A woman aged 23 years had suddenly noticed loss of vision in the left eye two days before. There was a mass in the left macular region about three disc diameters in size, projecting forward about 8 D. and sharply circumscribed. It was smooth and whitish, with many vessels running over the surface. The rest of the fundus was normal. The eye was enucleated and histologic examination showed that the inner limiting membrane was intact over the tumor. The rods and cones were preserved but markedly thinned under the center of the tumor. Bruch's membrane was intact. The tumor was predominately in the inner layers of the retina and appeared to have arisen there. It was composed chiefly of fibrillary astrocytes. The ophthalmoscopic

appearance is shown by a colored plate and the histologic findings by photomicrographs. J. Hewitt Judd.

Messinger, H. C., and Clarke, B. E. **Retinal tumors in tuberous sclerosis.** Arch. of Ophth., 1937, v. 18, July, pp. 1-11.

In 24 cases, reported in the literature of retinal tumor in association with tuberous sclerosis, the findings are summarized and tabulated. In addition, the case reported of a man aged twenty years who complained of frequent severe convulsive attacks, one of which proved fatal. Postmortem examination revealed typical lesions of tuberous sclerosis, including multiple tumors of the brain, rhabdomyoma of the heart, lipofibromas of the kidneys, and adenoma sebaceum of the Pringle type. In the right eye there was a single raised, whitish tumor 3 mm. in diameter, which covered the upper inner two-thirds of the optic disc. The tumor involved all layers of the retina and invaded a portion of the optic nerve. In its central portion was a large irregular mass of ossification, and about this were calcium-containing concretions. The authors feel that the cytologic evidence, together with the embryologic possibilities, justifies the conclusion that these tumors are essentially gliomatous. This microscopic study of the retinal tumor is the fifth recorded and the first to be reported in this country. But the authors feel that the lesion has a higher incidence than the literature indicates. (Photograph, photomicrographs.)

J. Hewitt Judd.

Papolczy, F. **The prognosis of glioma retinae.** Klin. M. f. Augenh., 1937, v. 99, Sept., p. 355.

In the united eye clinics of the University of Budapest glioma occurred

from 1920 to 1935 in 27 cases, in 24 of which the fate of the patients is known. Excluding four bilateral cases, seven cases were operated upon in the first stage and none died, while out of seven operated upon in the 2nd stage two died, and of six operated upon in the third stage all died. The child suffering from glioma dies within two and a half years from metastasis if the eye has not been removed at the right time. Only after two years' observation can one speak of cure. Roentgen and radium treatment and diathermic coagulation are the only therapeutic procedures to be attempted in cases of bilateral glioma after one eye has been removed and the glioma has attacked the other eye. A fairly certain result can after proper radiation be expected only in the first, or at the best in the second stage of the disease. C. Zimmermann.

Pimentel, Paulo. **Retinal glioma.** Annaes de Ocul. do Rio de Janeiro, 1937, 5th year, no. 5, pp. 9-14.

A woman of 55 years came complaining of loss of vision of the right eye, and also of recent pain. A trephine operation was done for relief of intraocular tension. It became necessary to remove the eyeball about ten months later. Pathologic examination disclosed a small encapsulated tumor, very vascular and without zones of degeneration. Microscopically the tumor was composed of fibers with cells having small nuclei, taking the stain well, distributed uniformly, and without organization. The cells were adult glial, probably from the microglia, and therefore benign in character. W. H. Crisp.

Reiser, K. A. **Remarks on the question of heredity of glioma retinae.** Klin. M. f. Augenh., 1937, v. 99, Sept., p. 350.

Out of the great number of gliomas of

the retina included in various statistics, only fifty cases of familial occurrence have been known. On closer scrutiny, however, numerous families are found in which several children but neither parent had glioma. The families in which members of several generations have had glioma of the retina are extremely rare. At the eye clinic of Bonn, since 1907, eighteen children were treated for glioma which occurred before the fifth year. In sixteen families followed up, 64 children were born, but in each family glioma occurred only in one child, even in large families of 7, 9, and 16 children. For the great majority of isolated gliomas, heredity has not been demonstrated.

C. Zimmermann.

Spratt, C. N. **Primary carcinoma of the lacrimal sac.** *Arch. of Ophth.*, 1937, v. 18, Aug., pp. 267-273.

In a man aged 78 years the removal of a supposed mucocele was followed by the appearance of a hard fibrous mass which later invaded the orbit, producing exophthalmos and necessitating exenteration of the orbit. There was no local recurrence in the orbit but there was extensive metastasis to the submaxillary lymph nodes, which responded to radium and roentgen treatment. The patient died from coronary thrombosis eight years after the first appearance of the growth, four years after exenteration of the orbit, and two years after the radium treatment of the involved glands. There was no recurrence in the glands. The findings in sixteen additional cases reported in the literature are discussed and tabulated.

J. Hewitt Judd.

Veil, P., and Desvignes, P. **Report of choroidal sarcoma observed during seven years and having begun with a**

**central scotoma.** *Ann. d'Ocul.* 1937, v. 174, Sept., pp. 576-588.

A man aged 59 years was examined in June, 1928, on account of lowered vision in the right eye. The vision of the left eye was very poor from herpetic scarring two years before. The fundus of the right eye seemed entirely normal and the vision was 20/20 with correcting lenses. Within three months the vision had fallen to 0.3 and at that time small pigmented spots were found in the macular area and a grayish edematous zone was seen below and temporal to the disc. There was a sharp central scotoma for colors. The Wassermann reaction was weakly positive. Antisyphilitic treatment was instituted and the vision fluctuated between 0.8 and 0.1. Repeated fundus examinations were made. A definite elevation developed in the grayish zone near the disc and considerably later a mass protruded into the vitreous, covering the disc. In February, 1935, a detachment of the retina appeared. By June the detachment was so extensive that the eye was useless; so enucleation was permitted. Microscopic examination showed a sarcoma of the choroid extending from the edge of the macula to the disc. The disc was covered by a tumor mass which extended into the vitreous. Globular pigmented areas found in the macular area explained the ophthalmoscopic picture. There is a discussion on the occurrence of central scotomata in sarcomas of the choroid.

John C. Long.

## 16

### INJURIES

Bochever, E. M., Shartz, S. E., and Stein, S. I. **Electromagnet operation.** *Viestnik Opht.*, 1937, v. 10, pt. 5, p. 747.

A detailed analysis of 86 severe per-

forating ocular injuries. The data show that the patients were most frequently young people between twenty and thirty years of age. The left eye was involved more frequently than the right. Most of the patients were machinists. The earlier treatment was instituted the better was the result. Most frequently the injury was corneoscleral. The foreign bodies were usually localized in the posterior segment of the eyeball. The results of extraction through the posterior route were not inferior to those of anterior extraction. Prolonged observation is necessary for determination of the final visual result. In 25 percent of the cases the eye had to be enucleated in spite of successful extraction of the foreign body.

Ray K. Daily.

Burnier, Penido. **Traumatic angiopathy of the retina.** Arquivos do Inst. Penido Burnier (Brazil), 1937, v. 4, June, pp. 268-275.

The case was the only one of its kind among 78,000 patients seen at the institute in the course of twenty years. The patient was a man of forty years who in an automobile accident sustained fracture of five ribs and developed a pleural effusion. Both eyes showed the ophthalmoscopic picture of retinal lymphorrhagia (Purtscher). When the patient was first seen ophthalmologically vision was reduced to counting fingers at 0.5 meter (right) and 0.2 meter (left). In the course of a year the vision of the right eye rose to 0.5 and that of the left eye to 0.1. The general ophthalmoscopic appearance was a good deal like that of albuminuric retinitis. The posterior pole of each eye was sprinkled, from the disc to the macula, with whitish spots like flakes of cotton, between which were to be seen discrete hemorrhages. At the

macular region of the left eye was a fringed exudate suggestive of the macular star of albuminuric retinitis; and there was a paramacular hemorrhage in the right eye. These lesions persisted, with later development of secondary atrophy of the disc, more marked in the left eye. The author favors explanation by lymphorrhagia due to sudden hypertension of the cerebrospinal fluid, and fat embolism of the retina. (Bibliography.) W. H. Crisp.

Cameron, W. G. **Acid burns of the eyes.** Trans. Western Ophth. Soc., 1935, 2nd mtg., pp. 64-67.

A woman of seventy years had both Gasserian ganglions operated upon for relief of trifacial neuralgia. This naturally left both corneas without sensation. She inadvertently used from the medicine chest a solution of dilute hydrochloric acid, instead of boric acid, as an eye wash. The severity of the burn was not noticed because of the anesthetic corneae. Twelve days after the accident two small yellow ulcers appeared in the center of the left cornea. They coalesced, and when the dressing was removed from the eye on the twelfth day the lens was on the dressing. This eye was later enucleated. Five months after the accident, the right eye perforated and the contents of the eyeball were extruded.

George N. Hosford.

Gallino, J. A. **A rare case of intraocular foreign body.** Arch. de Oft. de Buenos Aires, 1937, v. 12, June, p. 403.

The foreign body was lodged in the physiologic excavation of the optic nerve; was originally overlooked in spite of a track through cornea, iris, and lens; and was discovered three years after the injury. There was a cen-

tral scotoma, and vision was 20/120.  
M. Davidson.

Gördüren. **Contribution to the explanation of rupture of the iris from ocular contusion.** *Klin. M. f. Augenh.*, 1937, v. 99, Aug., p. 207.

The left eye of a man of seventeen years was struck by the handle of a whip at the corneal margin in the 8 to 9 o'clock position, causing extraordinarily numerous ruptures of the iris. These consisted of isolated posterior radial tears of the pigment layer and sphincter, numerous superficial tears of the substance of the iris without participation of the sphincter, and two holes at the lacerations of the sphincter. Mechanically the radial tears of the pigment layer are ascribed to the local impact and to stretching of the iris backward. The ruptures of the sphincter are consequences of the intense counterpressure of lens and vitreous. The holes, and the almost total radial tear of the iris are attributed to the concerted action of the general concussion of the iris with the counter-wave of the impulse on the elastic capsule of the eye. (Illustration.)

C. Zimmermann.

Grzedzielski, Jerzy. **Localization of ocular foreign bodies.** *Klinika Oczna*, 1937, v. 15, pts. 2-3, p. 150.

An analysis of the various X-ray techniques and of their possible inaccuracies. The author uses as indicators two metal clamps of his own design at the upper and lower limbus. (Illustration.)

Ray K. Daily.

Hubbard, W. B. **Treatment of caustic burns of the eye.** *Arch. of Ophth.*, 1937, v. 18, Aug., pp. 263-266.

Further experimental studies were conducted on animal eyes to compare

the effect of irrigation with water with that of a weak neutralizing fluid. It was found that acid burns should be treated immediately with water, while alkaline burns should if possible be treated immediately by irrigation with a weakly acid solution, otherwise they should be irrigated with water and the weak acid should be instilled as soon as possible. The findings substantiate the theory that a soluble alkaline proteinate does not protect against further injury but an insoluble acid proteinate does.

J. Hewitt Judd.

Klang, Gunnor. **Solar scotoma.** *Acta Ophth.*, 1937, v. 15, pt. 3, p. 295.

A detailed review of the literature and study of eleven cases caused by the solar eclipse in 1912, six of which had been examined previously. In half of these cases there were central or paracentral scotomata, with denser central portions. The author finds that the ophthalmoscopic findings were not proportional to the visual disturbances, there being cases with scotoma but no fundus changes, and vice versa. The subjective symptoms were moderate.

Ray K. Daily.

Lijo Pavia, J. **A rare ophthalmoscopic appearance due to intraocular birefringent crystals.** *Arch. de Oft. de Buenos Aires*, 1937, v. 12, May, p. 231; also *Rev. Oto-Neuro-Oft.*, 1937, v. 12, June, p. 147.

In two cases iridescent bodies were observed in the vitreous, 4 or 5 diopters from the posterior pole in one case and from the papilla in the other. One gave a history of an injury of unknown nature in childhood, another was observed two years after extraction of an intraocular foreign body followed by iridocyclitis, pupillary occlusion, attempted corelisis, and accidental iride-

remia. The bodies were believed to be cholesterol crystals. The faithful reproduction of the colors in a fundus photograph is emphasized. M. Davidson.

Lijo Pavia, J. **Intraocular foreign body, its retinographic history.** Arch. de Oft. de Buenos Aires, 1937, v. 12, July, p. 433; also Rev. Oto-Neuro-Oft., 1937, v. 12, Aug. p. 215.

An intraocular foreign body (steel) imbedded in the fundus two disc diameters below the macula, and complicated by intraocular hemorrhage, was retained for seven years with preservation of normal vision. There was only a small scotoma in the field. The bright surface of the foreign body was colored slightly green, and there were traction folds of the retina adjacent to it. (Illustrated.) M. Davidson.

Löhlein, W. **Detachment and accident.** Klin. M. f. Augenh., 1937, v. 99, Sept., p. 376.

Löhlein gives a systematic synopsis on traumas of various kinds and their possible effects in detachment of the retina. C. Zimmermann.

Matsuda, Morikata. **A phenomenon in chalcosis bulbi; and extraction of an intraocular piece of brass.** Klin. M. f. Augenh., 1937, v. 99, Sept., p. 320.

The right eye of a miner of thirty years was injured by explosion of a gun cap. After seven months the temporal ciliary part of the iris showed a yellowish elevation and a posterior synechia. This was removed. It contained a small piece of brass. The previous fluctuations in size of the temporal root of the iris, and the occurrence of another yellowish nodule at the lower angle, seem to be well explained by formation of copper salts. (Illustration.) C. Zimmermann.

Morse, A. W. **Magnet extraction of intraocular foreign bodies.** Trans. Western Ophth. Soc., 1935, 2nd mtg., pp. 9-14. (See Amer. Jour. Ophth., 1936, v. 19, Jan., p. 40.)

Nascimento, Heitor. **Intraocular foreign bodies. Our results in their localization with the Sweet apparatus.** Arquivos do Inst. Penido Burnier (Brazil), 1937, v. 4, June, pp. 324-332.

The author favors the Sweet method, which has been used at the Penido Burnier Institute since 1928. He reports nineteen cases seen in the course of eighteen months. W. H. Crisp.

Riddell, W. J. B. **Eyelash in the anterior chamber following the removal of an intraocular foreign body.** Brit. Jour. Ophth., 1937, v. 21, Sept., pp. 506-507.

The eyelash entered after removal of the foreign body and before the keratome section had healed. Had the lash entered at any other stage there would have been an attendant inflammatory reaction. The patient was noted to have possessed heavy lashes which frequently fell on the dressings. The lash was not removed, as the eye remained quiet and there was no gap in the posterior capsule and no discomfort, and vision of 6/18 was maintained. (2 references.) D. F. Harbridge.

Rocha, Martins. **Traumatic ophthalmoplegia.** Arquivos do Inst. Penido Burnier (Brazil), 1937, v. 4, June, pp. 349-353.

A man of 25 years received a contused wound of the outer end of the eyebrow. The conjunctiva was chemotic, the upper lid ptotic, the eyeball completely immovable. There was slight exophthalmos, with paralytic mydriasis, and absence of the photo-

motor reflexes. The media were clear, but there was slight pallor of the optic disc. The cornea was insensitive and there was anesthesia in the region of the nasal branch of the ophthalmic nerve. Three months after the injury the symptoms had practically disappeared except that the patient had an optic atrophy due to compression of the nerve by hemorrhage in its sheath.

W. H. Crisp.

Spackman, E. W. **Localization of intraorbital foreign bodies.** Arch. of Ophth., 1937, v. 18, Aug., pp. 204-232.

The principles and methods of roentgen technique are discussed and the various factors entering into the interpretation are presented. The simple method of taking two projections at right angles is recommended only for identification. The geometric method of localizing a foreign body with relation to a fixed marker is as a rule sufficiently accurate. The physiologic methods which depend upon rotation of the globe between predetermined points for study of the resulting behavior of the foreign body with regard to the optic center, are of special use at the posterior segment. The stereoscopic methods were found to be less accurate than other standard methods. Accessory methods include visualization of the anterior part of the globe free from interference by the bony structures, the injection of air or opaque material into Tenon's capsule to identify the posterior part of the sclera, autovisualization, and the methods using markers introduced into the conjunctival sac. Data were compiled to show the degree of visibility of various particles in relation to their size and specific gravity. J. Hewitt Judd.

Spaeth, E. B. **Light adaptation at the macula; an example of its indus-**

**trial importance.** Arch. of Ophth., 1937, v. 18, Aug., pp. 248-254.

This report is based on the application of laboratory methods in an attempt to solve a serious industrial problem resulting from temporary blindness of railway firemen after exposure to the light of the fire box. Determinations were made on the effect of the illumination of the fire box on the observer's reaction time for finding and calling correctly the assimilated three point position light signal. (Discussion.)

J. Hewitt Judd.

Vajda, Géza v. **A case of disjunction of the corneal epithelium spontaneously developing within half an hour.** Klin. M. f. Augenh., 1937, v. 99, Aug., p. 248.

Fifteen minutes after preparation for cataract extraction (argyrol, tonogen, retrobulbar injection of novocaine 4 percent), a woman aged 58 years showed below the center of the cornea a transparent hole of 1-mm. diameter within a gray opacity of 4 mm. diameter. In a few minutes the gray discoloration extended to the corneal periphery. It corresponded to the disjunction of epithelium described by Szily, Sr., although no preceding blister had been observed. After several months treatment with dionine, iodine, quinine, and arsenic, the eye quieted down, so that the operation could be performed successfully. By Kreilich and Salus a vasomotor trophic neurosis of the corneal epithelium is assumed as etiologic factor. The cocaine may have been the exciting cause in this case.

C. Zimmermann.

## 17

### SYSTEMIC DISEASES AND PARASITES

Almeida, A. de, and Sales, M. **Considerations on ocular cysticercus.** Ar-

quivos do Inst. Penido Burnier (Brazil), 1937, v. 4, June, pp. 314-319.

Four cases are added to the literature. Diagnosis was established by the complement-fixation reaction. Three patients had a plastic choroiditis of metastatic character, another had atrophy of the eyeball and retinal detachment. These cases constitute an argument against treatment by injections of corrosive sublimate, since the parasite, even when dead, is capable of causing deep lesions. (Illustrations.)

W. H. Crisp.

Charlin, Carlos. **Essential (?) neuralgia of the ophthalmic division of the trigeminal nerve due to bacillary toxemia. Tuberculin therapy.** Ann. d'Ocul., 1937, v. 174, Sept., pp. 588-595.

Charlin has previously reported in this journal two cases of neuralgia relieved by tuberculin therapy. He reports the case of a man aged 36 years who had suffered for five years from severe daily attacks of trigeminal neuralgia. Very diversified methods of treatment had been used with little success. General physical examination was essentially negative, as was the Mantoux reaction. Methylated tuberculous antigen was injected every four or five days for a long period. A day or two after the injection there would be a mild neuralgic attack. After the injections were stopped the pain did not return and the patient has been symptom-free for seven months. Charlin considers these cases to be due to tuberculous toxemia and to be comparable to the neuritis of lead poisoning, diabetes, and autointoxication.

John C. Long.

Custodis. **Rare ocular complications in infectious diseases (diphtheria, scarlatina, measles).** Zeit. f. Augenh., 1937, v. 92, Aug., p. 336.

In the three patients, each of whom had one of the three exanthemata mentioned in the title, severe ulcers due to streptococcus occurred in the skin about the eyes. F. Herbert Haessler.

Dauids, Hermann. **Eye affections in agranulocytosis.** Zeit. f. Augenh., 1937, v. 92, July, p. 193.

Dauids reports a case of agranulocytosis in which the first manifestation was a necrotic lesion of the conjunctiva. Shortly before death, two small white lesions developed in the fundus, where the blood vessels had been tortuous. The patient had taken no pyrimidon. Two other case reports are abstracted from the literature. One patient had eczema swelling and redness of the lids and a conjunctival lesion which was characterized by chemosis and mucopurulent exudate. In the second patient there was serous exudate, later purulent with greyish plaques, and board-like swelling of the lids. The third patient had focal necrosis of the bulbar conjunctiva. Infiltration, marginal ulcer, and ring abscess of the cornea have been observed. In this author's patient, the retinal lesions were thought to be septic.

F. Herbert Haessler.

Eagleton, W. P. **Suggestions for prevention of ocular and aural sequelae of meningococcic meningitis.** Arch. of Ophth., 1937, v. 18, July, pp. 46-49.

Several anatomic facts are pointed out which are of assistance in the early diagnosis and treatment and in understanding the sequelae of any form of meningitis. An attempt should be made to prevent the ocular sequelae of meningococcic meningitis by treating the various lesions causing such ocular disturbances, at the site of the embolic infarction. In those cases presenting vertical nystagmus it is suggested that serum be injected into the

basal cistern, and in meningococcic panophthalmitis due to emboli the injection of serum into the anterior chamber or even into the vitreous might be tried, as in all such cases the condition otherwise ends in blindness.

J. Hewitt Judd.

Hamburger, F. A. **Oculoglandular tularemia.** Graefe's Arch., 1937, v. 137, pt. 3, p. 419.

Three cases are described in which the clinical appearance and the course of the ocular condition resembled those of Parinaud's conjunctivitis. Two of the patients had dressed hares preparatory to cooking them, one two days before and the other six days previous to the onset of the ocular symptoms. The third patient had eaten roast hare about two weeks earlier. Dilution of the serum 1 in 40 was positive for agglutination with *Bacillus tularensis*. Peritoneal injection of conjunctival material and blood into guinea pigs revealed tularensis. Oculoglandular tularemia and Parinaud's conjunctivitis are therefore to be considered as one and the same disease. H. D. Lamb.

Kamman, G. R. **The eye in neurology.** Amer. Jour. Ophth., 1937, v. 20, Nov., pp. 1132-1139.

Marval, Luis de. **Blood disorders and their ocular complications.** Oftalmologia (Buenos Aires), v. 2, pp. 38-50.

This is a general review of the subject.

Valle, Sergio. **Prophylaxis of blindness from leprosy.** Rev. de Ophth. de São Paulo, 1936, v. 5, Sept., pp. 3-10, and Dec., pp. 85-96.

The literature of this relatively hopeless field of ophthalmology is reviewed. Mention is made of some details of pre-

liminary care and protection of the eyes from irritation which it is thought may have a slight value in prophylaxis.

W. H. Crisp.

Vasque Barrière, A. **The herpetic virus in ocular pathology.** Oftalmologia (Buenos Aires), v. 2, pp. 16-37.

This is a general review of the subject.

Zambrini, A. R. **Sinus affections with ocular repercussion.** Oftalmologia (Buenos Aires), v. 2, pp. 5-15.

This is a general review of the subject.

## 18

### HYGIENE, SOCIOLOGY, EDUCATION AND HISTORY

Berens, C., and Goldberg, J. A. **Syphilis in relation to the prevention of blindness: a study of 100,000 case records.** Jour. Amer. Med. Assoc., 1937, v. 109, Sept. 4, p. 777.

Incompleteness and inadequacy of records and clinical observations, and also of social service and follow-up work, in the various eye clinics are brought out in this study. If much unnecessary blindness caused by syphilis is to be prevented, the recommendations embodied in this reprint must be considered seriously and carried out in hospitals and clinics. (4 tables, discussion.) George H. Stine.

Chance, Burton. **A sketch of the early days of ophthalmology in Philadelphia.** Arch. of Ophth., 1937, v. 18, July, pp. 23-45.

This historical review begins with Phillip Syng Physick, who began practice in Philadelphia in 1792; and it traces the development of the specialty through the first half of the nineteenth century. It recounts the founding of the

Wills Hospital and the establishment of the first systematic ophthalmologic lectures in America by Parrish and Frick. The many contributions to optics, ocular anatomy, and surgery by that "age of clinical intuition" are reviewed. Photographs of the pioneer practitioners and pages from the early writings and books are reproduced.

J. Hewitt Judd.

Dornseiff, F. **Hesiod and the Bible on the origin of light.** *Klin. M. f. Augenh.*, 1937, v. 99, Sept., p. 376.

In this brief note the author refers to his book and former essays on the subject.

C. Zimmermann.

Esser, A. M. **Blindness in the Indian proverbs of wisdom.** *Klin. M. f. Augenh.*, 1937, v. 99, July, p. 94.

From the 7,613 proverbs translated from the Sanskrit by Böhlingks and from other sources the present author collected utterances of poets and thinkers as reactions of the Indian soul to the problem of blindness.

C. Zimmermann.

Galewska, Zofia. **The work of the trachoma division of the eye clinic of the Joseph Pilsudski University.** *Klinika Oczna*, 1937, v. 15, pts. 2-3, p. 341.

A report of the work in a twenty-bed service.

Ray K. Daily.

Gallino, J. A. **Sight-saving schools.** *Arch. de Oft. de Buenos Aires*, 1937, v. 12, April, p. 194.

The history of the movement for the creation of sight-saving schools and classes is reviewed, and its introduction into the Argentine is advocated.

M. Davidson.

Ibanez Puiggari, M., Soriano, F. J., and Picoli, H. **Notes for the history of the Santa Lucia Eye Hospital (Buenos**

**Aires).** *Arch. de Oft. de Buenos Aires*, 1937, v. 12, June, p. 351.

The Santa Lucia Eye Hospital, established by a decree of the Argentine Government in 1823 (and in function for over half a century), and the Eye Service of the National Clinical Hospital, have been the centers of growth of Argentine Ophthalmology, and the institutions where all Argentine ophthalmologists received their training. The leading teachers of the Santa Lucia Hospital were Roberts, Guerrico, Wernicke, Oyenard, and Ibanez Puiggari. The succession at the National Clinical Hospital was Cleto Aguirre, Lagleyze, Demaria, Noceti, and Argañaraz. Roberts had studied at Moorfields and with de Wecker, and wrote in 1879 his "Clinica Oftalmologica." Wernicke was a product of German and Austrian eye clinics, and in the course of sixty years had built up a rich library of ophthalmology. The Santa Lucia Hospital was aided by a large contribution from Dona Julia Saenz Rosas de Roseti to erect a new edifice embodying the most modern conceptions of an Eye Hospital. An outstanding feature of the Hospital is the Neurosurgery department, where special research on action currents has been carried on under the direction of Balado. The total number of patients last year was 28,331. (Illustrated by photographs of the principal figures of the medical and social service administration, a list of the numerous ophthalmologists trained in the institution, and their principal contributions to ophthalmology.)

M. Davidson.

James, R. R. **William Porterfield.** *Brit. Jour. Ophth.*, 1937, v. 21, Sept., pp. 472-477.

This article, rather than being a biography of Porterfield on whom little

authentic material is obtainable, is a review of his book published in 1759 under the title "A Treatise on the Eye, the Manner and Phaenomena of Vision." The book is found to be an excellent elucidation of the anatomy and physiology of the eye.

D. F. Harbridge.

Kazlauskas, P. **Occupational dermatosis in the ophthalmologist.** *Klin. M. f. Augenh.*, 1937, v. 99, July, p. 83.

After general remarks on allergy, the author reports his own clinical history of two years of eczema of his fingers, which resisted all kinds of treatment, until he found that it was caused by pontocaine used in the treatment of his eye patients. After discontinuing the use of pontocaine he made a rapid recovery.

C. Zimmermann.

Lijo Pavia, J. **Welfare work in diseases of the eyes.** *Rev. Oto-Neuro-Oft.*, 1937, v. 12, May, p. 119.

Methods of blindness prevention are discussed, and the need for greater activity in the Argentine along the lines followed in the United States is stressed.

M. Davidson.

Parchomenko, M. E., and Mironenko, A. V. **Etiology of blindness in the data of the Kiev eye clinic.** *Viestnik Ophth.*, 1937, v. 10, pt. 5, p. 735.

A diagrammatic analysis of the etiology of blindness in 1,438 hopelessly blind patients seen at this clinic during the last twenty-five years. The most frequent causes were diseases of the optic nerve, traumatism, glaucoma, and syphilis. The most hazardous periods relative to vision are the first five years of life and the years between 21 and 50. The vocational factors cause blindness in men from traumatism, diseases of the optic nerve, and syphilis, and in

women from glaucoma, trachoma, scrofula, and diseases of the cornea. During the last ten years blindness from blennorrhea has diminished because of the extensive application of Credé's prophylactic method and the increase in the number of obstetric beds. Blindness from traumatism has increased on account of military operations; but sympathetic ophthalmia has decreased as a result of improved medical service. During the World War and the Russian civil wars the percentage of blindness from smallpox and trachoma has increased. During the last ten years the number of blind from these causes has diminished because of compulsory vaccination for smallpox and the campaign against trachoma.

Ray K. Daily.

Penichet, J. M. **Modern ideas on hygiene of the eyes.** *Rev. Cubana Oto-Neuro-Oft.*, 1936, v. 5, Nov.-Dec., p. 175.

In a paper written for popular reading, the prevention of hereditary affections, care of the eyes at birth, in infancy, and at school, the prevention of avoidable injuries, the benefit of glasses, and the hygiene of illumination are briefly outlined.

M. Davidson.

Rainey, C. W. **A visual-acuity survey: report of 721 cases.** *Amer. Jour. Ophth.*, 1937, v. 20, Sept., pp. 930-936.

Reis, Wiktor. **The eye in expressionist art.** *Klinika Oczna*, 1937, v. 15, pts. 2-3, p. 254. (See *Amer. Jour. Ophth.*, 1937, v. 20, Nov., p. 1186.)

Rice, C. E. **Ophthalmological indications of disease. A study of ancient skulls in the National Museum.** *Amer. Jour. Ophth.*, 1937, v. 20, Oct., pp. 1045-1046.

Rodin, F. H. **Ophthalmologists, optometrists, and opticians; the origin of these words in the English language.** Trans. Western Soc., 1936, 3rd mtg. pp. 116-130. (See Amer. Jour. Ophth., 1937, v. 20, Feb., p. 234.)

Schmidt. **An obituary on Professor Dr. Paul Römer.** Zeit. f. Augenh., 1937, v. 92, Aug., p. 273.

Römer died at Bonn April 29, 1937, aged 64 years. Formerly director of the University Eye Clinic at Bonn, he had been on the emeritus list for over a year.

## 19

### ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Damel, C. S. **Comparative embryology of the crystalline lens.** Arch. de Oft. de Buenos Aires, 1937, v. 12, June, p. 324.

A study of fourteen human, bovine, and chick embryos at various stages

is illustrated with photomicrographs and confirms the classical work of Mann. M. Davidson.

Damel, C. S. **Embryology of the papilla.** Arch. de Oft. de Buenos Aires, 1937, v. 12, June, p. 307.

The embryology of the papilla is recapitulated and is illustrated with a series of photomicrographs.

M. Davidson.

Jakob, Christian. **Phylogeny of the optical system.** Oftalmologia (Buenos Aires), v. 2, pp. 51-73.

This is a general review of the subject, beautifully illustrated by photomicrographs of the eyes of lower animals.

Neher, E. M. **The origin of the spectacle or Brille in crotalus confluentus lutosus (Great Basin rattlesnake).** Trans. Western Ophth. Soc., 1936, 3rd mtg., pp. 166-178. (See Amer. Jour. Ophth., 1936, v. 19, Sept., p. 838.)

## NEWS ITEMS

Edited by DR. H. ROMMEL HILDRETH

640 S. Kingshighway, St. Louis

News items should reach the Editor by the twelfth of the month

### DEATHS

Dr. David Harrower, Worcester, Mass., died August 7, 1937, aged 80 years.

Dr. William Lincoln Noble, Chicago, died October 14, 1937, aged 76 years.

Dr. William Craig Meanor, Pittsburgh, Pa., died September 26, 1937, aged 65 years.

Dr. William Edward Colgin, Waco, Texas, died September 10, 1937, aged 37 years.

### MISCELLANEOUS

The George Washington University School of Medicine, Washington, D.C., offers an intensive postgraduate course in ophthalmology, April 18 to 23, 1938, inclusive. Lectures will be given by the following guests: Dr. Harry S. Gradle, (1) Practical points in the office practice of ophthalmology, (2) Practical points in ophthalmic surgery; Dr. John Green, The medical treatment of glaucoma; Dr. E. C. Ellett, The surgical treatment of glaucoma; Dr. W. B. Lancaster, How accommodation affects refraction; Dr. S. Judd Beach, (1) Refraction, (2) Preparation for the American Board examinations; Dr. J. H. Dunnington, Retinal detachment; Dr. Arthur J. Bedell, Fundus lesions in vascular hypertension and arteriosclerosis; Dr. A. D. Ruedemann, Allergy in relation to ophthalmology; Dr. John N. Evans, Visual fields in glaucoma and optic atrophy; Dr. Frank E. Burch, Cataract extraction; Dr. Alfred Cowan, Physiological optics; Dr. Jonas Friedenwald, Ocular tuberculosis; Dr. W. H. Crisp, Refraction with particular reference to cross cylinders; Dr. LeGrand H. Hardy, Illustration in relation to ophthalmology; Dr. Edmund B. Spaeth, Plastic surgery of the eye; Dr. S. Hanford McKee, Bacteriology of the eye; Dr. Derrick Vail, Anesthesia, local and general, in ophthalmology; Dr. R. von der Heydt, Slitlamp microscopy.

Resident members will lecture as follows: Dr. William Thornwall Davis, Vascular hypertension and arteriosclerosis; Dr. G. Victor Simpson and Dr. George B. Jenkins, Central visual pathways; Dr. Ernest Sheppard, A review of the ocular manifestations of syphilis; Dr. E. Leonard Goodman, Etiology and treatment of iritis; Dr. Ronald A. Cox, The lacrimal apparatus; Lt. Col. J. E. Ash, M.C., U.S.A., Lt. Col. Frederic H. Thorne, M.C., U.S.A., and Capt. Elbert DeCoursey, M.C., U.S.A., of the Army Medical Museum, Histopathology of the eye. Fee for the above course \$40.00.

In addition to these there will be given a course by the Resident Staff limited to 20 par-

ticipants, April 15 to 17, 1938, inclusive. The names will be filed in order of reception. 1. Surgery of the eye on the cadaver and on animal eyes, accompanied with illustrated short talks on the operations to be considered. 2. Ocular pathology at the Army Medical Museum, by Lt. Col. J. E. Ash, M.C., U.S.A., Lt. Col. Frederic H. Thorne, M.C., U.S.A., and Capt. Elbert DeCoursey, M.C., U.S.A. 3. Practical course in the technique of orthoptic training with short talks on the application of the knowledge of the subject. The fee for this last-named course will be \$25.00. For further details apply to the Secretary, Miss Louisa G. Wells, 927 Seventeenth Street, N.W., Washington, D.C.

The Twelfth Annual Spring Graduate Course in Ophthalmology and Otolaryngology will be held at the Gill Memorial Eye, Ear, and Throat Hospital, Roanoke, Virginia, April 4 to 9, 1938. The class will be strictly limited to fifty men. The following list comprises the names of the guest faculty:

Dr. Walter E. Dandy, Baltimore, Md.; Dr. John A. Kolmer, Philadelphia; Dr. Chevalier L. Jackson, Philadelphia; Dr. I. Friesner, New York; Dr. John J. Shea, Memphis, Tenn.; Dr. Claire L. Straith, Detroit; Dr. Edmund B. Spaeth, Philadelphia; Dr. Bernard M. Samuels, New York; Mr. E. B. Burchell, New York; Dr. Daniel B. Kirby, New York; Dr. LeGrand H. Hardy, New York; Dr. Grady E. Clay, Atlanta, Georgia.

### SOCIETIES

The next meeting of the American Ophthalmological Society will be held at the Mark Hopkins Hotel, San Francisco, California, June 9, 10, 11, 1938.

The Eye Section of the Philadelphia County Medical Society met on November 4, 1937 at the Wills Hospital. Patients were demonstrated and new apparatus was shown.

The 66th Annual Meeting of the American Public Health Association held October 5th to 8th, 1937 in New York City, registered a larger number of delegates than at any meeting in the Association's history. A number of important resolutions were adopted. Some of the outstanding ones establishing Association policies may be summarized briefly as: A resolution reiterating the attitude of the Association toward the removal of public health administration from political interference and control; A resolution in favor of Congressional appropriations

for a minimum of two years for a nation-wide statistical survey of the accident problem; A resolution supporting the development of more adequate diagnostic services for the control of syphilis; A resolution supporting the Vinson Bill as the best procedure and organization for lessening the danger to public health from stream pollution; A resolution pledging active support to measures which seek to secure better maternal and neo-natal care; A resolution authorizing a special committee to study the public health aspects of medical care, especially of chronic diseases. As to Association leadership for the coming year, Dr. Arthur T. McCormack was inducted into the office of President, Mr. Abel Wolman, Professor of Sanitary Engineering, Johns Hopkins University, Baltimore, was named President-Elect. Dr. Thomas Parran and Dr. John P. Koehler were returned to the Executive Board. The 1938 Annual Meeting will be held in Kansas City.

At a recent meeting of the Buffalo Ophthalmologic Club, the following officers were elected. Dr. Ivan Koenig, president; Dr. Robert Wilson, vice-president; Dr. Meyer H. Riweh, secretary and treasurer.

The Club was well represented at the recent meeting of the Academy in Chicago. The following members were present: Drs. Ivan Koenig, Thurber Lewin, Walter King, Harry Cowper, A. L. Bennett, P. Lewis, Robert Wilson, Meyer Riweh, William Howard, Harry Weed, A. Luhr, J. Schutz, Clara March, M. Bourne.

At a meeting of the Corpus Christi Eye, Ear, Nose and Throat Society at the Stanley Grill on October 14, 1937, the following officers were elected: Dr. Edgar G. Mathis, president, and Dr. E. King Gill, secretary-treasurer.

The first meeting of the Montreal Ophthalmological Society was held in the McGill Medical Building on October 14, 1937. The following program was presented: Dr. Stuart Ramsey, Acne rosacea associated with glaucoma; Dr. F. T. Tooke, Deformity at the inner canthus with convergent squint; Dr. J. A. Macmillan, Lymphoma; Dr. A. G. McAuley, Injury to the optic nerve; Dr. J. Rosenbaum, Ophthalmoplegia totalis with optic atrophy, post-traumatic.

At the October meeting of the Cleveland Ophthalmological Club, the new officers for the ensuing year were installed. President, Dr. Paul G. Moore; Secretary, Dr. Leslie G. Miller.

On November 18, 1937, the Kansas City Eye, Ear, Nose and Throat Society visited in Omaha.

In the forenoon, they were entertained by members of the Staff of the Medical School of Creighton University; in the afternoon, by members of the Medical School of the University of Nebraska.

In the evening they were guests of the Omaha-Council Bluffs Eye, Ear, Nose and Throat Society at a dinner and meeting held at the Paxton Hotel.

#### PERSONALS

Dr. L. V. Johnson was recently appointed as a Fellow in Ophthalmology in the Western Reserve University, School of Medicine, Cleveland, Ohio.

Dr. Louis Bailly has been appointed Resident Ophthalmologist in the University Hospitals, Cleveland, Ohio.

Dr. William Evans Bruner, Professor Emeritus in Ophthalmology at Western Reserve University in Cleveland, Ohio, has returned from a short holiday in the Adirondack Mountains.

Dr. A. L. Schonberg, upon completing his ophthalmological studies in New York and Chicago, has returned to Cleveland and has been appointed to the Clinical Staff of the Lakeside Hospital Dispensary of Cleveland, Ohio.

Dr. C. I. Thomas, until recently Resident Surgeon at Lakeside Hospital, has been appointed to the Junior Intern Staff in the Department of Ophthalmology in the University Hospitals, Cleveland, Ohio.

At the October dinner meeting of the Cleveland Ophthalmological Club, Mr. Harry Guilbert of the Pullman Company of Chicago, gave an interesting and instructive address on "Eye safety measures used in the Pullman Company."

Dr. Joseph H. Ralston has been appointed to the Ophthalmological Staff of the Cleveland Public School System.

At the annual meeting of the North Eastern Ohio Teachers Association, Dr. Paul Motto, Senior Instructor in Ophthalmology at Western Reserve University, School of Medicine, spoke before the Sight Saving Teachers Association on "The modern approach to the cross-eye problem." Dr. Motto accompanied by Mrs. Motto, has left for Cairo, to attend the International Ophthalmological Congress.

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